

CEREDI'S PUMP

[by John H. Lienhard](#)

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Today, we meet a man who reinvented Archimedes' pump. The University of Houston's College of Engineering presents this series about the machines that make our civilization run, and the people whose ingenuity created them.

Now and then I run into a student who says, "I like engineering just fine; but why should I hafta take philosophy?" He fails to see that what we do is shaped by the way we think about things -- that our technology and our philosophy bend to fit each other. Here's an example:

Archimedes invented a really clever pump in the third century BC. It's been used all over the world ever since. It looks like a tube coiled around a long axle. You tilt the axle and put its lower end in water. Then you turn it. The open end of the tube picks up water, and, as the coil turns, water passes from one loop to the next until it comes out at the upper end.

It's a pretty subtle gadget -- not the sort of thing you just stumble across. Archimedean pumps were widespread in the Classical world, and Roman authors described them. Well, they tried to. We've just seen that they aren't easy to describe.

Archimedes' pump didn't do so well during the High Middle Ages, when European attitudes were strongly shaped by Aristotle's philosophy. Aristotle very clearly separated motion into two kinds -- motion in a straight line and rotary motion. These pumps mixed the motions. They used rotation to move water upward along an axis. They were anti-Aristotelian, and they were hard to find during the Renaissance.

Now in 1565 a Renaissance agricultural engineer named Giuseppe Ceredi patented an Archimedes pump. He systematically described the installation and use of batteries of these pumps for both irrigation and drainage. But we wonder how he could be given a patent for a known device.

When you compare Ceredi's dimensioned drawings, flow calculations, and economic analysis with the almost unreadable Roman descriptions, you begin to see why. Ceredi might well have found the idea in the old literature; but he put flesh and blood on it. After Ceredi's work, these pumps were quickly accepted across southern Europe. They were not, as one author puts it, "something that would be created spontaneously by peasants." And they certainly weren't something that people would take up naturally in a world that didn't want to mix straight-line and rotary motion.

Ceredi had a right-brain ability to visualize. He had a left-brain ability to execute and organize detail. But he was also able to break the strait-jacket of Aristotelian thinking. A few years later, Galileo took up full-scale combat with Aristotelian ideas of motion. And Ceredi's reinvention of Archimedes' pump was a harbinger of that philosophical revolution.

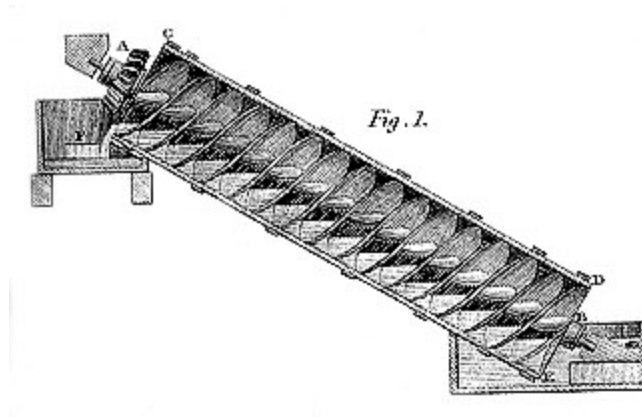
I'm John Lienhard, at the University of Houston, where we're interested in the way inventive minds work.

(Theme music)

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This episode has been greatly revised as [Episode 1543](#).



From the 1832 *Edinburgh Encyclopaedia*

Spiral of Archimedes, or Archimedean pump

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