

SOME ANCIENT INVENTIONS.

More than two thousand years ago, Hero (or Heron), a philosopher and mathematician of Alexandria, invented the fountain shown in the annexed engraving. This device, because of its antiquity as well as its simplicity and completeness, is very interesting and instructive.

As represented in the engraving, it may be classed with toys, or at most regarded as only an apparatus for illustrating a scientific principle; but it is more than this. It is the progenitor of a number of modern inventions for raising water and producing air pressure.

The curious feature of the apparatus is that it apparently causes the water to rise above its own level by its own pressure, but such is not the case. Its action is due to the transference of the pressure of one column of water to another column of water at a higher level, through the medium of a column of confined air. It is as truly a case of the application of external power as it would be if a steam air compressor were applied.

The water to be elevated is contained by the upper bulb, which communicates at its lower side with the

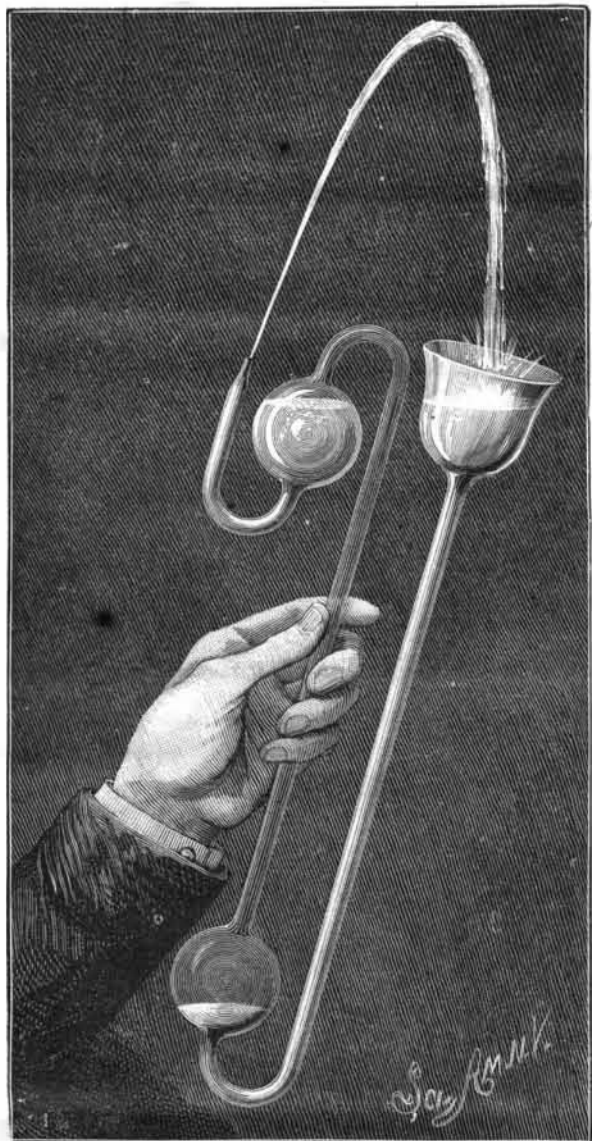


Fig. 1.—HERO'S FOUNTAIN.

fountain nozzle, and at its upper side with the downwardly curved tube connecting with the top of the lower bulb. A tube connecting with the lower side of the lower bulb extends upward to the level of the upper bulb, and terminates in a flaring cup.

The upper bulb, having been filled with water and the lower bulb with air, the fountain is started by pouring a small quantity of water into the cup, which by flowing downward through the tube connected with the cup exerts a pressure on the air contained by the lower bulb. This pressure is equal to the weight of the column of water in the tube. The air pressure thus created is transferred to the top of the upper bulb by the air column rising from the lower bulb through the tube connecting the two bulbs, so that the pressure of the water column descending from the cup, less a very small allowance for friction, is effective in forcing the water out of the upper bulb through the fountain nozzle.

The proper inclination of the apparatus directs the water jet so that the water falls into the cup and replaces the water used in creating the air pressure in the lower bulb.

When the lower bulb is filled with water and the water has been entirely discharged from the upper bulb, the action of the apparatus ceases; but it may be again started by inverting the fountain, allowing the water in the air bulb to run into the upper or water bulb, then righting it and again pouring a little water into the cup.

This device was employed during the last century for elevating water in the mines of Hungary.

In Fig. 2 is shown an interesting modification of

Hero's fountain. The apparatus is made of glass, to illustrate the principle on which it operates. It consists of a volute coil of tubing connected at its center with a hollow shaft communicating with a hollow journal box, from which a standpipe rises. When this coil is turned in the direction indicated by the arrow, water and air assume in the coiled tube positions relative to each other as shown in the engraving; the water being arranged in a series of curved columns on one side of the center of the wheel, the air being correspondingly disposed on the opposite side of the center. The height to which the water will be raised by this machine is equal to the sum of the height, above their upwardly curved lower ends, of all the curved columns of water contained by the coil. It will be noticed that the pressure of one curved column of water in the coil is communicated to the next through the intervening air, which weighs practically nothing.

This machine was invented by Wirtz, of Zurich, in 1746.

"In 1784 a machine of this kind was made at Archangelsky that raised a hogshead of water in a minute to an elevation of 74 feet, and through a pipe 760 feet long."

At first sight this pump might be confounded with Archimedes' screw or with the tympanum or scoop wheel, but it differs materially from these in its ability to force the water far above itself by virtue of its cumulative action.

Diamonds: Their Origin, Formation, and Uses.

Diamonds have been objects of interest both to the ancients as well as they are at present to all classes, but more especially to scientists and savants, to whom, even up to this present age, they are a mystery, as to their origin or formation. Though known to be composed of pure carbon, Pliny, as well as other ancient writers, seems to have been ignorant as to their characteristics, being imbued with more superstitious ideas than a true practical knowledge or estimate of their powers of resistance, believing they could only be crushed by a previous bath of goat's blood. Persians give special veneration to the diamond, owing to their belief that they fell from the heavens at the earliest creation of the world. Others attribute them to be of celestial origin, as aerolites, possessing electric light; others, again, believe them of vegetable origin, as some are found with water cavities, also vegetable as well as animal matter embedded in them. Workers in them seem to have a more true and practical knowledge of them, and feel convinced they are more of a volcanic origin, and their surmises may be correct, by the recent discovery in South Africa, where most of the supply is derived from the bed or mouth of an exhausted crater. Also in the discovery, within the past half century, of its sister morphonic gem, called "carbonato," which to an inexperienced eye (in some stages of its formation) has the outward appearance of crystals of emery, and when broken looks like fractured hardened steel; again, in other stages the appearance of porous lava; but even to the worker, as well as the scientist, their progressive age of formation still remains a mystery. It is impossible to say whether the above is an old or young diamond, being an opaque combination of minute gray crystals, compressed together by some natural force into such a dense form and temper as to make its sister lamellar and transparent gem subject to its attrition; and an invaluable adjunct in the mechanic arts. Again, we see the diamond in its transition state of formation from carbonato to that of a granular lamellar diamond flakes, and then progressing (if one may presume to so call it) into the opaque carbonaceous form called borts (like rough molten balls of glass), and when broken furnish fibrous splinters like asbestos, which are used for drilling holes in jewels, etc. Finally, they verge into the lamellar translucent and transparent state, having a cleavage like mica, of geometrical forms. Some of these crystals are formed with other small octahedron diamonds embedded in the side facets. As to the uses of the diamond in various ages and by different nations, they are undoubtedly prehistoric, and might be classed in their uses among the stone age. It has been conceded by modern savants that they must have been used in the days of the Pharaohs for something besides amulets. At a meeting of the Anthropological Institute of London, not long since, by a reading before them, Mr. W. M. Flinders had collected evidence in a tomb at Gizeh that tools armed with jewels had been used in the form of solid or tubular drills, as well as saws. The lines in cutting stone with these tools leave an unmistakable trace of their workings, which no other tool does.

The unfinished obelisk at the Egyptian quarries, which has been lying there for over 4,000 years, has continuous spiral grooves, being of uniform depth, showing the cutting edge of the tool was not in any wise impaired. Diamonds had different names in various ages, among nations and tribes. In the days of Solomon, "samer" or "shamer," after the miraculous stone-working worm of that name; by the Egyptians, auerchilis or chalazias; Grecian, adamas or adamantine; and by the Jews, iahaome, etc. Thus lost arts are

being restored to us by scientific research, and in recent years as well as the present. We now see the diamond advertised in multitudinous branches of arts. We had occasion, in our issue of May 5, 1876, to refer to diamonds and their uses, since which they have been growing rapidly in favor for trimming or truing chilled iron, paper calender and porcelain rolls, emery wheels, sawing and trimming stone, boring rock for tunneling and prospecting mines, etc.

The Vertigo of the Kajak.

Mr. Hastrup, a physician of North Greenland, has observed a curious affection that attacks the Esquimaux. Its name in the Esquimaux vernacular is the equivalent of our term "boat fright;" but Danish physicians call it "Svimmelhed i Kajak," or vertigo of the kajak (*Hospitals Tidende*, August 18, 1886; *Rev. internat. des Sc. med.*, September, 1886; *Med. Record*).

The disorder is described as follows: An Esquimaux, while sailing in his kajak upon a perfectly calm, smooth sea, is suddenly seized with a feeling that his boat is tipping to one side. He jumps to the other side to preserve the equilibrium, but this only makes matters worse, and he abandons himself to anxious and even

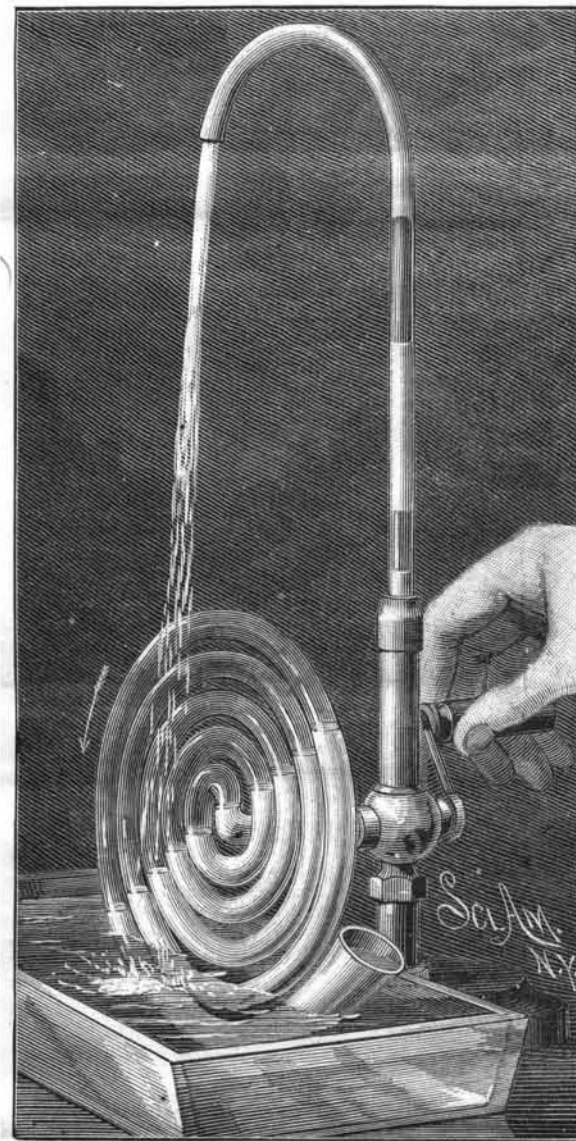


Fig. 2.—WIRTZ'S PUMP.

frenzied attempts to keep the boat from tipping. He can no longer fish, and his trouble does not cease until he gets in sight of shore or of another boat. These attacks are not accompanied or preceded by any malaise or nausea. There does not appear to be true vertiginous sensations, but there is rather an hallucination of the sense of equilibration. The disorder attacks the Esquimaux when they are apparently in full health, and it is not accompanied with headaches, tinnitus, palpitations, convulsions, or paralyzes. It may last a lifetime, or go away as it comes, quite suddenly. It is a great misfortune to the patient, since he can no longer fish, and is practically an unproductive member of society. The disease has been attributed to the excessive use of coffee and tobacco, but Mr. Hastrup has observed it in men who used neither of these substances.

A Ten-Inch Draught Steamboat.

A steamboat has been built to navigate the Allegheny River between Pittsburg and Kittanning, a distance of 45 miles. Although 142 ft. long and 25 ft. beam, she draws but 10 in. of water. It has been nearly or quite twenty years since steamboat packets ran on the Allegheny, and it has been believed that the railroads had crowded them off for all time, but the builder of the craft mentioned—the Nellie Hudson—believes that there is still a chance for a line of properly constructed boats, and, if this first venture pays, we believe he intends to add other boats, and perhaps run some of them as far up as Oil City.

There must be many streams navigable for steamers of light draught like the above. It only requires a little enterprise to make them available.