

DIFFERENCES BETWEEN GASES AND VAPORS.

Vapors are saturated gases, or, gases are vapors surcharged with heat. Ordinary steam is the saturated vapor of water, and if any of the heat be withdrawn from it, a portion of the water is necessarily precipitated. This is not so in the case of a gas under ordinary conditions. But if the gas be forced into a very small bulk, it will follow that any diminution of the temperature will cause a portion of the gas to condense into a liquid. Superheated steam resembles gas in its qualities, and a portion of the heat may be withdrawn from such steam without producing the precipitation of any part of its constituent water. (*Bourne*).

Steam was among the motive agents of the most ancient idols of Egypt (as the statue of Memnon, and others), and some of the deified images of Europe; and it is curious to note that it should formerly have been employed with tremendous effect to delude men—to keep them in ignorance—while now it contributes so largely to enlighten and benefit mankind.

Steam has, of course, been noticed ever since the heating of water and cooking of food were practiced. The daily occurrence implied by the expression "the pot boils over," was as common in antediluvian as in modern times; and hot water thus raised was one of the earliest observed facts connected with the evolution of vapor. From allusions in the most ancient writings, we may gather that the phenomena exhibited by steam were closely observed of old. Thus, Job, in describing Leviathan, alludes to the puffs, or volumes, that issue from under the covers of boiling vessels: "By his neesings a light doth shine, and his eyes are like the eyelids of the morning; out of his nostrils goeth smoke [steam] as out of a seething pot or cauldron." In the early use of the vessels last named, and before experience had rendered the management of them easy and safe, women would naturally endeavor to prevent the savory contents of their pots from flying off in vapor; hence attempts to confine it by covers; and when these did not fit sufficiently close, a cloth, or some similar substance, interposed between it and the edge of the vessel, would readily suggest itself, and a stone or other weight placed upon the top to keep all tight would also be very natural. Then, as the fluid began again to escape, further efforts would be made to retain it by additional weights. In this manner, doubtless, many a contest was kept up between a pot and its owner till one gained the victory, and we need not the testimony of historians to determine which one this was. In those times it was not generally known that a boiling cauldron contained a spirit, impatient of control, that the vessel was the generator of an irresistible power, and the cover a *safety valve*; and that the preservation of the contents and the security of the operator depended upon letting the cover alone, or not overloading it; hence it no doubt often happened that the confined vapor threw out the contents with violence, and then it was that primitive cooks began to perceive that there was death as well as life in a boiling pot. In this manner, we suppose women were the first experimenters with steam (engineers), and the earliest witnesses of steam boiler explosions.

Ancient priests, both among the Jews and Gentiles, were, from their ordinary duties, necessarily conversant with the generation of steam. Its elastic force could not, therefore, escape the shrewd observers among them. Sacrifices were frequently *boiled* in huge cauldrons, several of which were permanently fixed in the vicinity of temples—in "boiling places," as their locations are named by Ezekiel, "where the ministers of the house shall boil the sacrifice of the people."

It would seem, moreover, as if some of the boilers were made on the principle of Papin's digester, in which bones were softened by "high steam"; at any rate, a distinction is made between seething pots and cauldrons, and from the manner in which both are mentioned they seem to have been designed for different purposes; the former to seethe or soften bones, the latter to boil the flesh in only. "They roasted the passover with fire, but the other offerings sod they in pots and in cauldrons," (ii. Cor. chap. 35, p. 13). "Set on a pot, set it on, and also pour water into it. Gather the pieces thereof into it, even every good piece, the thigh and the shoulder; fill it with the choice bones. Take the choice of the flock and burn (or heap) also the bones under it, and make it *boil well*, and let them *seeth the bones* of it therein." (Ezek. 24, p. 3, 5). The belief that the Jews had close vessels in which steam was raised higher

than in common cauldrons, is also rendered probable from the fact that the Chinese, a contemporary people, employ similar ones, and which, from their tenacity to ancient devices, have probably been used by them from time anterior to those of the prophets. ("Davis' Chinese," ii. 271; "John Bell's Travels," i. 296, and ii. 13).

Some of the ancient philosophers, who were close observers of nature, compared the earth to a cauldron, in which water is heated by internal fires; and they explained the phenomena of earthquakes by the accumulation of steam in subterranean caverns, until its elastic energy rends the superincumbent strata for a vent. Vitruvius explains by it the existence of boiler springs. In the reign of Justinian, Anthemius, an architect and mathematician, illustrated several natural phenomena by it; but of this we should probably never have heard had it not been for a quarrel between him and his next door neighbor, Zeno, the rhetorician. This orator appears to have inherited a considerable share of credulity and superstition, which gave his antagonist the advantage. Anthemius, we are informed, had several steam boilers in the lower part of his house, from each of which a pipe conveyed the vapor above, and by some mechanism, of which no account has been preserved, he shook the house of his enemy as by a real earthquake, upon which the affrighted Zeno rushed to the Senate, "and declared in a tragic style that a mere mortal must yield to the power of an antagonist who shook the earth with the trident of Neptune."

The boiler engineer of to-day, noting the curious things in bronze and in copper exhumed at Pompeii, and gathered together in the Musco Borbonico, at Naples, will linger near a small vessel for heating water, little more than a foot high, in which are combined nearly all the principles involved in the modern vertical steam boiler—fire box, smoke flue through the top, and fire door at the side, all complete; and, strange to say, this little thing has a *water grate*, made of some small tubes crossing the fire-box at the bottom, an idea that has been patented twenty times over, in one shape or another, within the period of the history of the steam boiler.

The boilers of the fast boats built by the Herreshoff Company, of Bristol, R. I., are similar in construction to those found in the Thermae at Pompeii, taken from impressions left in the mortar or cement in which they were embedded. Some idea of the capacity of these boilers may be derived from the fact that a single establishment could accommodate *two thousand persons* with warm, or rather *hot*, baths at the same time. Seneca, in a letter to Lucilius, says "there is no difference between the heat of the baths and a *boiling furnace*"; and it would, he observes, appear to a reasonable man as a sufficient punishment to wash a condemned criminal in them. The persons who had the charge of heating in close vessels and distributing daily such large quantities of water, must necessarily have been conversant with the mechanical properties of steam, and the economical modes of generating it.

(To be Continued.)

TRADE NOTES.

Says the Port Hope *Guide*: "We noticed a large shipment of Spooner's Copperine going to Goldie & McCulloch, Galt, a day or two since. It's a production of our town—it's the metal above all other metals, and this settles it. There will not be a hot box for miles around Galt as long as Copperine holds out."

The Dominion Leather Board Co., of Montreal, have purchased the property and water power at Sault au Recollet, near Montreal, formerly owned by Messrs. McNiven & Cole, including saw mill, grist mill and what is familiarly known as Sault au Recollet Paper Mills, and are making alterations in saw mill to use it for their leather board and friction board mill, and will run the paper mill on building, roofing, sheathing and flooring felts.

Mr. H. W. Petrie, dealer in machinery of all kinds, who has been energetically building up a business all over Canada, announces the removal of his headquarters from Brantford to Toronto. This step became necessary because his increased transactions require the best facilities for transportation, also buildings and appliances for handling heavy machinery, etc. Therefore he has built new brick premises 40 x 124 feet, near the Union Station, on Front St., west of the Walker House, with massive beams, steel girders, steam hoists, and every facility for handling heavy goods, and lighted by electricity.

A piece of mica was recently taken from the mines near Buckingham, Que., which measured 7 feet 6 inches in height and 38 inches thick. This is said to be the largest solid piece in America.