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Contents:

(Illustrated articles are marked with an asterisk.)

SUBSTITUTING OTHER VAPORS FOR STEAM.---VAPOR OF LIQUEFIED CARBONIC ACID.

Most volatile liquids resemble water in this respect: That when heating them many degrees above their boiling point, the tension or pressure exerted upon the vessel containing them increases in an enormous ratio for a comparatively slight rise of temperature. The table below sllustrates this in regard to water and liquid carbonic acid; but it should not be overlooked that these pressures are only obtained as long as there is liquid present; when the last drop is evaporated, and dry steam or pure carbonic acid gas is obtained, the law for the expansion of gases by heat is applicable; the expansion being then uniform for equal degrees of rise in temperature, and by no means subject to the enormous increase experienced as long as unevaporized liquid is present.

If, then, we can get no advantage in using liquids requiring a small amount of latent heat for their evaporation, as shown on page 119, we may, by using liquids of very low boiling point, take advantage of the slight difference in higher temperatures, able to produce evaporation and condensation. If we would apply this principle in the use of steam, we stumble at once on the high temperatures required; if we heat water, for instance, in a closed vessel, from 212° to 248° Fah., we increase the pressure one atmosphere, that is, for 248—212 or 36° Fah. increase in heat, we increase the pressure only 15 pounds per square inch, scarcely half a pound for every degree of heat, while if we add the same quantity of heat to water previously heated to 473° and bring it to 509°, the expansive force of the steam will be raised from 35 to 50 atmospheres; this is 15 atmospheres or 15×15 pounds per square inch. The increase is now 15 pounds or one atmosphere for every degree of heat added. Two vessels of water thus, in which such a difference of temperature was maintained, could, when connected by proper arrangements, be made to exert this difference of pressure on both sides of a piston, and thus drive machinery, with a steam pressure of 15 atmospheres and even more, if a difference of more than 15° in heat was only maintained.

As said above, the very high temperature required is the objection to the use of this principle in the case of water and steam; but when going down to the bottom of the list of condensable gases, or to the top of the list of volatile liquids, and selecting one of the most volatile, say liquefied carbonic acid, which boils at 148° below zero, Fah., we have a liquid which, at the common temperature of say 60° Fah., will exert a pressure of 51 atmospheres, and at the freezing point or 32° a pressure of 38 atmospheres, giving thus a difference of 12 atmospheres or 180 pounds per square inch for only a cooling of 28°, which in the case supposed may be effected by means of ice. We have thus here a prime motor driven by the use of two reservoirs, the temperature of one of which is kept up at some 60°, simply by the heat of the surrounding air, while the other is cooled by ice and kept at some 32°; in this way, a power may be kept up equivalent to that produced by a high pressure boiler carrying 180 pounds of steam. The curiosity of this arrangement is the fact that in place of storing up coal for the production of heat, we store up ice for the production of cold. One great objection would, however, be that one pound of ice will only subtract, by its melting, 142 units of heat, while one pound of coal will, by its combustion, produce some 14,000 units of heat. We should thus require about 100 pounds of ice as equivalent for only one pound of coal; if we add to this the difficulty of keeping ice and the ease of keeping coal, and above all, if we consider the enormous strength of the vessels required, and also of the cylinders and connecting tubes, all able to stand about 1,000 pounds per square inch, making the apparatus heavy and dangerous: also if we consider the obstacles which such thick plates offer to the transmission of slight differences of temperatures, it is evident that such strong surface condensers cannot act properly; add to all this the expense of the liquefied carbonic acid, the ease of its escape when confined under the required high pressure, its corrosive action on the metals, the objection that such an engine would have to work with a back pressure on its piston of some 700 or 800 pounds per square inch, while the comparatively slight excess of 80 or 100 pounds would be the motive power, etc., and it is clear that the plan is utterly impracticable.

But the old saying of Cicero "that there is no theory so absurd that there are no philosophers to defend it" may be applied to inventors; and it may be said that no contrivance is so objectionable but there are inventors who attempt to bring it in practice. It is the same with this carbonic acid power. A few years ago a pamphlet appeared under the title: "Power without fuel; an investigation of the means by which it may be obtained from natural sources." In this publication, the author attempts to prove the practicability of the plan explained.

On the title page of the pamphlet referred to, we find the following remarkable note: "The right is reserved to patent in the United States any of the plans herein described. None of them will, however, be patented in any European country; they will be free to all who may there choose to employ them." This is simply a bait to European inventors, in order to save our inventor here trouble and expense; giving him, in case the idea should perhaps turn out to be practical, the advantage of the American monopoly, which surely would be worth something if—successful.

To recondense the gas by pressure is of course out of the question, as it would be equivalent to a water wheel pumping up the water which drives it.

We close with the following table of the remarkable effects of heat on water and liquid carbonic acid:

TABLE SHOWING THE COMPARATIVE TEMPERATURES OF STEAM AND CARBONIC ACID, PRODUCING THE SAME PRESSURE.

Pressure in Atmosphere.	Temperature required for this purpose. Of water.	Of liquefied carbonic acid.
100	577	120°
90	566	109°
80	554	98°
70	541	87°
65	534	81°
60	526	75°
55	518	67°
50	509	59°
45	500	52°
42	491	45°
39	482	33°
34	464	23°
29	446	13°
24	428	3°
22	420	—4°
20	410	—8°
18	401	—13°
16	392	—22°
14	380	—27°
12	368	—32°
10	356	—43°
8	338	—53°
6	320	—62°
5	302	—70°
4	288	—78°
3	275	—90°
2½	262	—102°
2	248	—114°
1½	232	—128°
1	212	—148°

Authorities agree as to the steam pressures corresponding with the different temperatures, as contained in this table; in regard to the pressure of the liquefied carbonic acid gas, those for temperatures above 32° Fah. have been taken according to Pelouse, and for the low temperatures, from 52° to —148°, according to the determinations of Faraday.

SULPHITE OF SODA AS A REMEDY FOR SMALL POX.

We publish in another column a very interesting letter upon this subject, the writer of which desires his name to be suppressed, as he does not wish to detract from the force of his statements by creating an impression that he is puffing a nostrum from personal motives. Though personally unknown to us, we have formed a high opinion of the candor of this writer, both from the communication itself and the private letter that accompanied it.

The statements made are in the highest degree remarkable. Small pox has so long been considered an incurable disease, not to be arrested by any human means when once its virus has entered the circulation of those unprotected by vaccination or previous attacks of the same complaint, that the announcement of even a single successful cure will arrest public attention at once.

The remedy named, sulphite of soda, has been growing in favor for some time as an antidote for blood poisons, which act seemingly like ferments; and we have ourselves witnessed apparently happy effects produced by its use in complaints supposed to arise from such poisons. Its value in this class of diseases has been so far demonstrated that it has been made an officinal remedy.

If we are to credit the statements of our correspondent, a most astonishing effect upon the small pox poison was produced by something, which, if it was not the *sodæ sulphis*, ought to be most earnestly sought. We are not aware that any spontaneous resolution of this terrible disease ever has taken place, of a character that could be mistaken for the cure ascribed to the action of the drug under consideration. The drug produces in proper doses no effects to be feared, and can therefore be made the subject of experiment without danger to patients. Its merits, therefore, as a small pox remedy ought to be at once thoroughly tested, and if it should be found that the cure alluded to was probably an effect of the crude petroleum employed to anoint the body, or the result of a cause unknown, the fact that a cure is alleged should stimulate investigation into the real cause. It is, we believe, very rare that an unfavorable prognosis, based upon the acuteness of pain in the head and back in attacks of small pox, fails to be verified. In the particular case described, these bad symptoms were strongly marked, yet the patient, the next day after the character of the complaint was deemed established by the eruption, was convalescent, and in a few days recovered without the formation of a single pustule.

There is, of course, the possibility that there was a mistake in diagnosis, and that the disease was not really small pox, yet this seems rather improbable. The hope that a cure, for such a scourge as small pox, may be discovered prompts us to call particular attention to the letter of our correspondent; and we most sincerely wish that the supposed efficacy of this simple remedy may be demonstrated to be a verity.

COMPULSORY SAFETY GAGES.---THE STEAMBOAT OWNERS' PROTEST.

A meeting of steamboat owners, held in Philadelphia on Friday, February 2d, resulted in a decided expression of opinion adverse to the action of Congress in rendering it compulsory for them to use certain so-called safety appliances *per se;* but they maintain with much reason that, as they are compelled to assume a responsibility, they should be the judges of the best means to fulfil such obligations.

It is objected that the appliances, in question are not safety appliances in fact, but only so in name, and that the act enforcing their use was passed in the interest of private individuals who hold by patent the monopoly of certain inventions. Mr. Copeland, of New York, a well known and able engineer, pronounces the "safety gages" prescribed in the act as actually perilous to human life, so much so that several steamboat companies have resolved to carry no more passengers till the regulation is abrogated.

The principle of this kind of legislation is wrong, and when adopted always acts in an oppressive manner. It is right that steamboat proprietors should be held responsible for the lives and safety of their passengers; but it is not right that they should be forced to use devices which they and experienced engineers regard as worse than useless. Their responsibility, if they are strictly held to it, will prompt them to select, under the best advice, all that can insure them from incurring damage from accidents to passengers. To arbitrarily select these things for them is to deal a death blow to that healthy competition which is vital to progress. So far from securing safety, such action actually defeats its avowed intent, and increases risk. The action of the companies, as stated above, is wise. Responsibility without free volition is always revolting to reasonable minds; no wonder the steamboat owners reject it. Let the law be either amended or repealed.

THE EFFECT OF SOUND IN BUILDINGS, AS INFLUENCED BY VENTILATION.

We noticed in a recent issue the publication of a work upon this subject.* We now take occasion to review the theory, and its claims to become accepted as science.

It is scarcely necessary to dwell upon the importance of constructing public buildings with reference to the effect of sound. There are so many in which it is difficult both to speak and to hear distinctly, that those who speak and those who listen may find examples without number to enforce the lesson. Any real contribution to our knowledge of the subject, that will enable architects even partially to correct the faults of present construction, would be eagerly embraced by them and find universal application hereafter. Mr. Saeltzer claims to have made such a contribution and to have discovered that, however correct the proportions and form of an auditorium may be with reference to acoustic effect, the result will be failure, unless the ventilation be made to correspond with certain principles, so called, which he lays down in his work.

The following propositions have long been accepted as part of the science of sound, namely: that sound is propagated by fluid, solid, or gaseous media, in waves or pulsations, which extend in all directions from the source of the sound—the sonorous body; that, in general, whatever may be the source of the sound and the number or kind of media that convey it, air forms the best medium by which it reaches the auditory apparatus; that the intensity of sound depends upon the density of the medium in which the sound is generated, and not at all upon the densities of the media which convey it; that the velocity of sound in air is independent of the density of the air; that the velocity of sound in air, at 0° C. or 32° F., is 1,090 feet per second, and that this velocity will be increased two feet per second for every centigrade degree the temperature is raised.

It is further known that the greater the elasticity of a medium is, the greater the velocity of sound through it, and the greater its density the less will be the velocity of sound traversing it, according to the following law. See Tyndall on "Sound," page 45:

"The velocity is directly proportional to the square root of the elasticity, and inversely proportional to the density of the medium." It follows that in media which, like air, obey Mariotte's law, namely: that their elasticity shall increase in exact proportion to their density, sound will, as above stated

* A Treatise on Acoustics in Connection with Ventilation, by Alexander Saeltzer. New York: D. Van Nostrand, 33 Murray street.