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EFFECTS OF CHLOROFOM.—The following is an abstract of an able paper read on this subject by Prof. Horsford, of Cambridge, Mass.

"The occasional deaths that have occurred in medical practice from the use of anæsthetic agents have, within the last two years, attracted a large measure of attention. It was earnestly maintained by some in this country that ether had been employed in all cases without injurious effects, and that the disastrous consequences were solely due to chloroform; while in England the two agents were held in the inverse order of esteem. Others in this country advocated the use of chloric ether, while it was generally believed by those who had most to do with these agents that the fatal results were due to idiosyncracies of temperament on the part of the patient, or in rare cases to want of attention and judgment on the part of the physician. There has been expressed an opinion that the injurious effects of chloroform are due to a volatile body accompanying the chloroform, and derived from the action of bleaching salt upon fusil oil—a constituent of most inferior alcohols. It was conceived that this body need be present only in a very small quantity to produce the fatal effects.

It was maintained by others that chloroform was susceptible of undergoing spontaneous change and becoming thereby unsafe for respiration.

In the midst of this variety of explanations of the ill-effects of anæsthetic agents, there appeared in the market from time to time chloroform impossible to inhale from the presence of free chlorine and hydrochloric acid; and another which, though not difficult to inhale, was found upon close examination to yield an offensive and unusual odor, as of something putrid. The latter may be easily purified by repeated agitation with sulphuric acid, and was the subject of experiment by Gregory, to whom we are indebted for the method of its purification. The former variety had not hitherto been the subject of special experimental inquiry.

The following investigation was undertaken with a view to determine the nature of this variety of bad chloroform:—

The sample of bad chloroform was contained in a ground stoppered bottle, and was not quite full. The space above the liquid, and the liquid itself presented a yellowish-green tinge. Floating upon the surface of the chloroform was a thin layer of deep yellow color of oleaginous consistency, which, when the vessel was agitated, separated into globules, as oil would agitated with water. Upon opening the flask, it yielded a strong odor of chlorine and hydrochloric acid.

A quantity of this bad chloroform placed in an inverted test tube over mercury, yielded more and more gaseous products at first of a decidedly greenish tinge, but becoming in a few days colorless. As might have been expected, chlorine and hydrochloric acid could be entirely withdrawn by distilation with soda and lime. A quantity so purified nine months since, is now perfectly good.

Another quantity in contact with cotton fibre (candle wick) in a few days became perfectly pure, and has so remained.

A better, and a thoroughly practical and simple method was discovered by the late Dr. Dwight, of Moscow, N. Y., namely, by agitation with a little alcohol.

Experiments made with alcohol to which was added impure methyl alcohol, (wood spirit) gave good chloroform.

Experiments with the product of distillation resulting from the mixture of pure fusil oil, water, and bleaching salt, upon man and inferior animals, were made under quite varied circumstances.

A practicing physician accustomed to the administration of chloroform, inhaled the vapor of this product for fourteen minutes, without any marked anæsthetic effect or any other effect than slight irritation of the bronchial tubes.

Two rats, one full grown, were successively subjected to the action of this agent, poured upon cotton to facilitate evaporation, the tuft of cotton and the animal being placed on the bottom of a covered becker glass. The air was renewed from time to time with the aid of a bellows. At the end of an hour no anæsthetic effect had been produced upon the full grown rat, and at the end of forty minutes none of the smaller animal. They were then exposed to the action of the vapor of chloroform, and in less than two minutes were insensible.

The experiment was repeated with kittens about a week old, with like results, except that they were longer in becoming insensible.

These experiments led to the conviction that fusil oil, when treated as in the manufacture of chloroform, substituting fusil oil for alcohol, is not changed, and of course that the fusil oil present in alcohol in the ordinary manufacture of chloroform, does not yield a poison, which, taken with the chloroform, has produced the fatal effects.

This opinion, our readers will perceive, is different from that described in previous numbers of the Scientific American, where the experiments of Dr. Jackson are detailed, as showing that fusil oil in some samples of chloroform was the cause of its fatality to human life. Dr. Simpson, of Edinburgh, held the same opinion. A series of important experiments were made by Dr. Gould, of the Lawrence Scientific School, which together with those of Prof. Horsford, have led them to adopt the following conclusions:—

1st. That good chloroform does not spontaneously change in a period of nine months.

2nd. That the bad chloroform, containing free chlorine and hydrochloric acid, may be produced by using a bleaching salt of great strength with a quantity of alcohol disproportionately small.

3rd. That the bad chloroform may be produced by receiving the distillate into water, so as immediately to withdraw the alcohol from the chloroform.

4th. That the bad chloroform may be produced by passing chlorine directly into chloroform.

5th. That no formula for its manufacture can be relied upon as a guide, since bleaching salts vary in strength when derived from different factories, and vary with age. In the foregoing experiments the range is from 15 to 30 per cent.

6th. That quick lime added to the mixture does not promote the economy of manufacture.

7th. That the chlorine and hydrochloric acid of bad chloroform, as observed by Dr. Dwight, may be removed by agitation with a little alcohol.

8th. That the ill effects observed in the administration of chloroform are not due to the presence of chlorine, as the irritation is such when it is attempted to inhale it, as to prevent inhalation altogether.

9th. That the ill effects are not due to any poisonous product arising from the action of bleaching salt on the small quantity of fusil oil, in the alcohol employed in the manufacture of chloroform.

10th. That the ill effects are due to peculiarities of constitution or temperament of some patients, and in a few cases to want of attention or judgement on the part of the person administering it.

These experiments and opinions will no doubt lead to still further investigations.

EVAPORATION OF FLUIDS—STEAM BOILER EXPLOSIONS.—The following is an abstract of an exceedingly able and interesting paper by Lieut. E. B. Hunt, U. S. N.:—

"If we study the phenomena attending the condensation of gases and vapors into fluids, it is apparent that while contigious molecules are still at distances many times as great as that characterizing the fluid state, the cohesive attraction manifests itself appreciably.—Steam instantly condensing, at the rate of a foot of steam to an inch of water, shows that in water the cohesive action of a molecule extends effectively through a sphere whose diameter is at least twelve times the distance between adjacent molecular centres in the fluid. Hence in water the radius of effective cohesive action must be so great as to include several molecular layers. The moment a gas ceases to follow Marriotte's law, cohesive action becomes appreciable, and this is proof enough that in masses many layers contribute their action in making up the total cohesion.

Fluid surfaces are in a state of weak cohesion as compared with fluid interiors; hence a partially atmospheric condition of rarifaction exists along such bounding surfaces. If then, we assimilate heat to a molecular repulsion, as is customary, we see at once that as the temperature is raised, the weak cohesion in the surface layer will be wholly overcome long before the mass is heated to that point which will overmaster its internal cohesion. Hence the surface molecules will freely pass off as vapor, while a strong cohesion still exists throughout the entire mass. Evaporation thus goes on at surfaces, at all temperatures above that which just suffices to overcome the weak surface cohesion. This constitution or structure necessarily characterizing the limiting layers of fluids, is the true and full explanation of evaporation in all its forms.—From this we see that a fluid mass, without interior or exterior surfaces, or so enclosed as virtually to answer this description, might be heated up far above the boiling point without boiling. We see that ebulition is but the effect of an internal evaporation starting in minute air bubbles, and growing with the expanding bubble.

EXPLOSIONS.—The condition requisite for ebulition in boiling water, is simply that air bubbles in the heated portions, shall present on their boundaries the weakly coherent surfaces, requisite for evaporation to be established. Perfectly de-airiated water, with a limited surface, would not boil at all, but would steadily heat up until it reached that point at which it would flash explosively into steam. Now, one chief cause of steamboat explosions is clearly of this description. The boat stops at a wharf; the doctor or pump supplying water to the engine, being worked by the engine itself, stops the water supply when the engine stops. The water in the boiler goes on boiling until all the air bubbles are boiled off from the water, and their air is mixed with the steam above. There then ceases to be any evaporating surface, except that on the top layer, which is farthest from the heating surface, and quite inadequate to the consumption of all the heat supplied. Then the mass of water begins to heat up, and it goes on storing up the unconsumed caloric, until the water is far hotter than the head of steam would indicate. The engineer then starts the engine; this starts the pump, which throws a stream of air charged with water directly into the glowing fluid. The heat instantly finds its outlet by an overwhelming evaporation on the newly supplied bubble surfaces, and a tumultuous ebulition follows. The gathered store of heat flashes off a portion of the water into steam of excessive tension—a tension such as nothing can withstand. The terrific consequences are too often witnessed in these fatal catastropes which have given to our Western rivers such a tragic reputation. No one can examine a list of Western steamboat explosions without being impressed with the frequency of these accidents just as the boat is starting from the wharf, after a landing. It seems to me beyond doubt that many of these occur just in the manner now stated, and from the deficiency of air bubbles in the boiler. We see in this reasoning too, a sufficient explanation of dry steam, or steam hotter than its tension indicates. The heating is then going on faster than the evaporation, and the steam is thus heated as if it were not in contact with the water, or were in a vessel by itself.

It is not always that the remedy for a danger is as obvious and as easily applied as in this case. It is only necessary to keep the pump in steady, slow operation, while the engine is at rest. It should always be capable of an independent movement, and should constantly, while a boat is fired up, be kept at work, however slowly. By this means air for ebulition will always be supplied, and the accumulation of heat in a sluggish mass of water cannot then go on until the explosive point is reached.

The explanation of evaporation which has been given shows that for each fluid the formation of vapor lies within certain definite limits of temperature, as a result of primary structure. These limits differ greatly in different fluids. Now, in framing the earth for habitation, or for the proper life of animal and vegetable forms, something equivalent to rain was necessary, from the constant descent of fluids to the lowest level. Without some agency to litt the great organic fluid above its lowest ocean bed, sterility would have been the lot of all which rose above its surface, and terrestrial organisms would have been quite impossible. But fluidity does not involve evaporation except within certain definite limits, special for each liquid. Again, evaporation might freely go on, and yet no capacity for condensation exist except within other limits of temperature, quite unattainable, save through special arrangement. Rain, then, with our earth and atmosphere, involved a special constitution of the raining fluid, not only so that evaporation at ordinary temperatures should go on, but so that condensation may again take place in the ordinary air. Not only must this qualitative arrangement exist, but also a quantitative one. Since the quantity of rain best sufficing to the aggregate organic need is exactly a certain definite number of inches per annum. Now, water is doubtless the only known liquid which could by possibility answer these definite mechanical conditions; hence we say, that there is a peculiarly clear evidence of design, first, in making a fluid which could, under our cosmical conditions, undergo the raining round, and secondly, in its being on the earth in so exactly the quantity best meeting the aggregate organic needs. Ether, quicksilver, or any other known fluid, could not, in any possible arrangement of quantity, supply this primary cosmical necessity. Now, when we reflect how many are the instances in which the terrestrial elements, simple and in combination, exist in strict adaptation to organic needs, both qualitatively and quantitatively, there is cumulative evidence of design furnished by a locomotive or cotton mill. Not only is organic life framed in strict relation to the earth, but the earth is also primarily constituted in strict relation to organic life. Let whoever doubts this study the extremely a-priori chance that a drop of rain of any liquid should ever fall upon the earth, and let him but picture the total lack of all land life which must have followed any cast of the die other than that really existing. Life without fluid circulation is totally inconceivable by the mind of man, and exactly to determine the appropriate kind and quantity of liquid, as has been done in the real frame of nature, was a problem of pure and absolute intellection, transcending the grasp of every mind save the All-Wise Creating Designer.

BAROMETER FOR NAVIGATING THE AMERICAN LAKES.—Dr. W. C. Redfield, of this city, read an interesting paper on the use of the Barometer for navigating our great inland lakes. He founded his remarks on the law of rotation in storms or cyclones.

"When a storm exhibits an easterly wind on the Atlantic Coast, the direct force of this wind seldom extends to the great Lakes.—Every great storm, when viewed in its geographical extent, is found to comprise a great cyclone, or eddying circuit of wind, which, on its first approach, in these latitudes, presents the wind from an eastern or southern quarter of the horizon, attended and sometimes preceded by a fall of the barometer, both of these phenomena being due to the northeastwardly progress of the cyclone and its turning motion, leftwise, around its own axis of rotation.—These first winds of the cyclone are often quite moderate, or even gentle, as compared with the succeeding westerly winds, which are to be experienced in the due course of rotative progression.

The navigator should carefully note that when, in the progress of the storm, the barometer has ceased to fall, the central portion of the cyclone has arrived or is nearly opposite his position, and that the local change of the storm-wind to the westward is soon to follow, being preceded, generally, by the first rising of the barometer. It is this period which constitutes the most dangerous crisis of the storm, of which the barometer affords warning. When afterwards the barometer has risen to its usual elevation, it affords evidence that the body of the stormy cyclone has mostly passed over. The navigator will perceive that all his precautionery measures should be taken during the fall of the barometer; and that in proportion as this fall takes place, the crisis of the storm becomes nearer to him, and its violence the more certain.