Heat and Cold.

For all that has been said by us on the subject of heat and its effects, there is still a great number who have no correct information to guide them, and to whom some standard knowledge will be a benefit. This opinion we have formed from the many letters we have received, relating to questions connected with this subject—a subject, indeed, which possesses a universal interest because it encircles every practical art in the world, and is only circumscribed in its relations by the universe itself. Man with all his powers of mind and great experience of memory treasured up in the records of men during many centuries, is still a very ignorant creature. He knows absolutely nothing of natural causes. When he sees an apple fall to the ground, or a stone flung from a sling return to earth again, he says, "the cause of this is the attraction of gravitation." Truly spoken, but "what is gravitation?" Aye, who can tell us that. Well, it is just the same with heat; we know its effects, but what it is in itself, is wrapt in as much obscurity to our minds as what gravity is. We talk of heat and we talk of cold, but when we ask, "what is heat," we are answered, "it is the absence of cold, and when we ask, "what is cold," we are answered, 'it [illegible] absence of heat."—Heat and cold is [illegible], the middle links of which only have [illegible] rendered visible to us. Extreme cold [illegible] the human system in many ways li[illegible]treme heat, but at the same time, they are generally opposites in their effects; great heat attenuates solids and renders them gaseous: while great cold will condense and solidify these. We think it is extremely cold when the thermometer falls to 32° Fah. below zero, and it is dangerous to walk abroad when the atmosphere is at that temperature; but artificial cold has been produced as low as 220° by Natterer, and 166° by Faraday. The greatest natural cold ever measured was 56° below zero. Ice melts at 32°, and this is called "the freezing point." A hot wind in upper Egypt has been found to be 117° or 19° above the temperature of human blood, consequently no man could live long in such an atmosphere. Alcohol boils at 173°, water at 212°. Tin melts at 442°, lead at 590°, and mercury at 662°; 980° is a *red heat*, and 1141° according to Daniell, is the heat of a common fire; brass melts at 1869°; silver at 2283°, and cast-iron at 3479°. These temperatures to produce the effects stated, have been established by good authority, and those of our readers who are not acquainted with them should treasure this up for present or future use.

Specific Heat.—Equal bulks of different substances, such as water and mercury, require the addition of different quantities of heat to produce the same change in their temperature. If two similar glass bulbs like thermometers, the one containing water and the other mercury, be immersed at the same time in a hot water bath, it will be found that the mercury bulb is heated up to the temperature of the water bath in half the time the water bulb requires to be raised to the same temperature; when exposed to the air, the mercury cools twice as fast. These effects must arise from mercury absorbing only half the heat that water absorbs in being raised to the same temperature. If we mix equal measures of water at 70° and 130°, the temperature of the whole will be 100°, but if we substitute for the water at 130° an equal measure of mercury, on mixing it with the water at 70°, the temperature of the whole will not be 100°, but about 90°; the mercury loses 40° of heat, which only raises the water 20°. Hot mercury therefore possesses only one-half the quantity of heat that a like quantity of water does at the same temperature; this fact is expressed in scientific language by saying of bodies, *their capacity for heat*.

It is more convenient to express the capacities of different bodies for heat with reference to equal weights than equal measures. By experiment it has been found that a pound of water absorbs thirty times more heat than a pound of mercury in being heated to the same number of degrees; the *capacity* of water for heat, therefore, is thirty times greater than that of mercury. The capacities of these two bodies are in the relation of 1000 to 33, and it is convenient to express the capacities of heat for all bodies in relation to that of water as 1000—such numbers are the specific heats of bodies. The specific heat of water is 1000, ice, 513, iron 113 79, zinc 95·55, mercury is really 33·32, lead 31·84. In equal weights of air and water, allowing water to be 1, the capacity of air is 0·2669—in other words a pound of water has 3·74 times the capacity for heat which air has, steam is to 1 of water, ·8470; carbonic acid is ·2124, a lower capacity than air. The capacity of both ice and steam for heat, is less than an equal weight of water. The specific heat of a body, therefore, may change with its physical state. Air contains latent heat, for if it is condensed into one-fifth of its volume by a piston in a small cylinder, as much heat is evolved as will ignite some inflammable substances. As carbon acid gas has a lower capacity for heat than air, it would be cheaper to use—taking fuel into consideration—than hot air for moving machinery. But as mercury is easily rendered volatile, and as its capacity for heat is 33 times less than water, it would certainly save fuel to employ it as a substitute for steam. This is no new idea, it has already been tried. About 15 years ago a beautiful little boat was built somewhere about the west of England, with an engine propelled by mercury, which was converted into gas by heat and used like steam, and was then condensed by some arrangement and used over and over again. It made one trip to Liverpool, and when it arrived at Princes Dock, the whole crew had to be sent to the hospital in a dreadful state of salivation, and that was the last of the mercury boat.

[For the Scientific American.]

Carbonic Acid Gas a Motive Power.

As our attention has been for some time turned to carbonic acid gas as a motive power, and seeing an article in your paper of the 25th April, in reply to a correspondent on that subject, we take the opportunity of addressing you the following particulars on the subject.

At the meeting of the British Association at Newcastle, Eng., in 1838, Robert Adams, Esq., solidified carbonic acid gas by means of an apparatus consisting of a strong wrought-iron vessel, in appearance like a swivel gun, two feet long and six inches in diameter, suspended by trunnions on an iron frame; also a vessel similar in form and size, but mounted perpendicularly on a flat stand; there were two pumps worked by powerful levers, together with the needful valves and connecting tubes. Into the generator, or suspended vessel, proper quantities of bi-carbonate of soda and warm water were placed; a long tube was also inserted, containing sulphuric acid, having its mouth closed with a screw valve. On the generator being rapidly whirled round on its trunnions, the sulphuric acid flows out and mixes with the solution of bi-carbonate of soda. The carbonic acid disengaged, having no room to expand, was condensed into a liquid. So far the apparatus resembles that first employed for the same purpose by M. Thellussier, in Paris, but stopping short here, Thellussier could only make use of about one-third of the carbonic acid disengaged, while Mr. Adams, by pumping it into the second vessel, obtained nearly the whole; on allowing this liquid carbonic acid to escape through a box, or hollow brass cylinder into the atmosphere, the instantaneous evaporation of one portion, caused it to absorb so much caloric as to solidify the remainder. The solid carbonic acid resembles in appearance and texture newly fallen snow or small hail; it evaporates rapidly, but not instantly, from the atmosphere of gas around it, preventing close contact; its intense coldness is not immediately felt, but the brass box in which it is collected, or the solid acid itself when long held, blisters the skin like hot iron; various experiments were tried with, it such as freezing large quantities of mercury, &c. But the circumstance of most consequence in relation to its practical employment, is, that it can be reduced to a liquid by a pressure of 36 atmospheres, or a column of mercury 90 feet, and at a temperature of 150° the liquid acid exerts an expansive force of 70 atmospheres, or 1050 lbs. on the square inch; and every increase of a single degree of temperature augments the pressure by upwards of an atmosphere or 15 lbs. on the square inch. None of the carbonates gives so much carbonic acid as the bi-carbonate of soda or the bi-carbonate of potash; 50 parts of the carbonate of lime (marble and chalk) combines with 49 parts of sulphuric acid, and gives 22 parts of carbonic acid. 76 parts of bi-carbonate of soda combines with 49 parts of sulphuric acid and gives 44 parts of carbonic acid. A cubic foot of atmospheric air weighs 527 04 grains, one cubic foot of carbonic acid weighs 804·79008 grains. Having the same capacity for heat as atmospheric air, it embraces the principle of being as great an economizer of fuel as air. We consider that it can be economically employed as a motive power. As the carbonic acid can be used frequently, besides the sulphate of soda, formed in preparing the gas, could be sold to advantage, or the soda might be recovered and sold as washing soda. Some may object to the using of this gas on account of its deadly nature, but we are convinced that it can be used with as much safety as steam. And having such an expansive force, an engine propelled by it would not require to occupy more than the one-hundredth part of a caloric engine of the same power, and about one tenth of the steam engine. You will perceive at once its great superiority over any other motive power (including hot air and electricity) for long voyages. or on long lines of railroad, where fuel has to form a great proportion of the freight.

Two Constant Readers.

Paterson, N. J., May 2nd, 1853.

[The foregoing communication is a very interesting one, as it displays an acquaintance with chemistry, and at the same time it presents some plain practical information which may be new to many of our readers. When carbonic acid gas was first reduced to a liquid, Sir I. Brunel took out a patent to employ it in an engine, but it failed to realize his expectations. Mr. Salomon, of Cincinnati, took out a patent in our own country for an improved carbonic acid gas engine, two years ago, since which time no engine of the kind has been introduced here. It is no doubt much superior to air as an economizer of fuel, but it has never been found to economize both machinery, fuel, and other expenses, as compared with steam, neither is it as economical as water.

Storm Pointer.

Messrs. Editors—In No. 23, present volume of the Scientific American, you published a statement how to make a "Simple Barometer and Storm Pointer," by G. I also saw, in an old German publication, a formula for the same purpose, differing somewhat from the above, as this writer adds camphor, and directs the vial to be hermetically sealed. I have tried both formulas and—failed, the sediment in the vial remaining perfectly quiet at the bottom in all weathers, storm or calm. Will your correspondent, "G.," state why his formula will not act as stated in his article? Or is there any one among the thousands of readers of the Sci. American who can give more light on the subject? If such a simple contrivance would indicate changes in the weather, as stated, "twenty-four hours before the tempest ensues," it would certainly be a very desirable and useful instrument.

Columbia, Pa. J. B. G.

[The only "Storm Pointer" on which we rely is a good barometer.—Ed.

Dr. J. V. C. Smith, of Boston, says that immense crops of poppies are raised in Switzerland, not for the opium, but for the oil extracted from their seeds. This oil is beautifully transparent, extensively used in house painting, colorless as water, and when mixed with white lead leaves a beautiful surface that never becomes yellow. Now that linseed oil is rising in price, and as much of our land is unfit for the cultivation of flax, he advises the attempt at cultivating the poppy here, which does very well even on poor, sandy soil.

Sea Bathing in Paris.

A project is on foot in Paris which has for its object to give to the Parisians the refreshment of sea bathing in the central part of the city. By the process of an hydraulic machine, placed on the still waters of Dieppe, the waters of the channel would be thrown into large pipes, which would carry it to Paris, and into a large basin placed in the centre of the Park of Mouceax. The expenditure is calculated at five or six millions of francs. The railway company from Dieppe to Paris have granted the privilege of laying the pipes all along the road, and the government has given to the undertaking the free use of the park of Mouceaux.

The benefits of sea bathing consist as much in breathing the sea air as rolling in the water.

Velocity of Rivers.

Messrs. Editors—Under the heading of "South American Rivers," in a late number of the Scientific American, I have observed the following statement: "three inches per mile in a smooth straight channel, gives a velocity of about three miles per hour." The same statement I observed many years ago in the "Pottsville Gazette," and as the statement cannot be true, only upon certain conditions, and no conditions being mentioned, exceptions may be taken to the statement. The velocity of rivers depends on several circumstances—the fall or rate of descent, the quantity of water, and the form of the channel, as well as the condition[illegible]moothness and straightness. The Ganges [illegible] said to have a velocity of about thr[illegible]per hour, with a fall of only four [illegible] mile, but with a mean hydraulic de[illegible]rty feet. The Ohio river, from Beav[illegible]Wheeling, has a descent of 9½ inches per mile, and yet the velocity of the stream at the Wheeling "bar," where the velocity must be greater than the uniform flow, is less than 2½ miles per hour in low water, but its velocity has increased to nearly 17 miles per hour during great floods. The Miami River, in Ohio, which has a fall of a little more than four feet per mile, has a velocity of about 7½ miles per hour during ordinary floods, but in low water I doubt whether the velocity reaches one mile per hour.

This is written only because the character of your paper may give more credit to the statement above quoted than it deserves, and consequently lead to error.

Dayton, Ohio. D. H. Morrison.

[We certainly believe that smoothness straightness, and the fall, as given in our extract, covers all that Mr. M. speaks of, excepting the quantity of water, which certainly should always be taken into consideration.—Ed.

Accident to Professor Liebig.

The "Augsburg Gazette" has the following from Munich, dated the 10th:—"Professor Liebig was last night giving a lecture on chemistry at the Palace, before Queen Maria, Queen Theresa, King Louis, the younger branches of the Royal family, and some persons belonging to the court, when a bottle of oxygen gas being improperly handed to him by his assistant, who took it for another bottle, an explosion took place, and the bottle flew into a thousand piece. Fortunately, the explosion occurred in an inner room, the door of which was open; still some fragments of the glass passed through the door, and slightly wounded some members of the Royal party who were sitting in the front rank. Queen Theresa was cut in the cheek, and the blood flowed in abundance; Prince Luitpold was slightly wounded in the forehead, Countess Luxburg in the chin, and Countess Sandizell in the head. None of these wounds will be of any consequence. The professor was also slightly injured, having escaped with his life by a sort of miracle."

The £1000 left by Franklin to the city of Boston, to be let on interest to young unmarried artizans in sums not exceeding £100 sterling, now amounts to $15,280,55. Franklin estimated that it would reach $581,640 in one hundred years, but owing to losses it will probably reach about $400,000. One provision of the will was that when the fund should amount to $581,640, half a million of dollars should be appropriated to some public work, which should be judged to be of the most general utility to the inhabitants of Boston. The loans are now rarely applied for at all, and it is proposed that the fund be deposited in the Massachusetts Hospital Life Insurance Co., and in the Savings Bank of Boston.