touch, which is that most favorable for the reiteration of the magnetic influence of the circuit upon an iron rod, cannot be adopted in the case of statical discharges of high intensity, since the proximity of the circumvolutions would enable the ethereal waves, notwithstanding the interposition of cotton or silk, to cross superficially from one to the other, parallel to the axis of the included iron, instead of pursuing the circuitous channel afforded by the helix with the intensity requisite to the polarization of the ponderable atoms.

(To be Continued.)

A Plan for Obtaining Pure Water from the Atmosphere, for the Supply of Vessels at Sea, and other purposes. By JOHN THOMSON.

TO THE COMMITTEE ON PUBLICATIONS OF THE JOURNAL OF THE FRANKLIN INSTITUTE.

Gentlemen:—Considering the necessity of water, as drink, to the existence of man, and that much real suffering and death has occurred upon the open ocean, from the want of it, I beg leave to express my fixed opinion, that pure water for drink may be extracted from the atmosphere, in a sufficient quantity to be of some service to the maritime community, and at a sufficiently cheap rate to warrant a trial upon a large scale. My researches and experiments prove satisfactorily that the atmospheric air of every climate is more or less charged with watery vapor, according to its temperature and locality, holding in solution from $\frac{1}{30}$ to $\frac{1}{300}$ part, by weight, of water—that a cubic foot of air at 66° is capable of holding in solution about 8 grains of water—that the capacity of air for holding water increases with the temperature—and that in a tropical climate, and over the ocean, it is at all times nearly saturated with vapor. This water, which is chemically combined with the air, shows itself at all times, when subjected to a diminished temperature, independent of electricity—and hence we have dews, fogs, rain, &c., under the operations of nature. But that which must strike the attention of every person, and which proceeds from the same cause, is the drops of water that collect upon the outside of a jug of cold water on a warm summer day.

I am well aware of the process of distilling sea water, which has long been practised with tolerable success, but fuel is not always to be had; neither is the drink thus obtained, as pure as could be wished.

I have never met with any proposal for obtaining fresh water artificially, at sea, without the expense of chemicals. The plan which I am about to propose, has such advantage, and may nevertheless go under the designation of distillation, although I dispense with fire; for I propose to condense the warm air of the atmosphere by the cold water of the ocean. I have attended to the temperature of the air in different latitudes, as also to its humidity and the dew point. I have likewise observed the degrees of heat that characterize the waters of a tropical sea from others more remote from the equator, and the depths at which a given temperature of the ocean may be had, together with the currents which circulate both the ocean and the atmosphere of the globe—all of which shows much intelligence and

labor in the experimentalists in these various branches of natural philosophy. But still I have to regret a want of experiments for the temperature of the ocean at smaller depths; although I find, from the many experiments that have been made by soundings, that there is a degree of cold in the ocean, (though at very great depths,) far beyond what is necessary for my purpose as a condensing medium, the obtaining of which at the surface, seems to me the only point at issue to crown my undertaking with success. Pursuing this one point, I find that the currents of the ocean, in sweeping along the bottom, are occasionally obstructed by banks, &c., which lift the cold waters up, and that even after mingling with the upper and warmer, the temperature is so much changed, that the thermometer was at one time seriously talked of as a necessary nautical instrument, for descrying danger when nearing land. The knowledge of hydraulics and hydrostatics emboldens me to say that a pipe could be let down from a float at anchor, over some well selected bank, reaching to a depth sufficient to bring up these bottom waters, and that the motion of the under current is amply sufficient to continue a circulation (as only a circulation, and not a lifting, of the waters is what is required) of the cold stream in the pipe, and through the machine, without the use of any other power—whilst a windsail could convey a continuous current of atmospheric air through the apparatus to be acted on by the water, as in a common distilling operation—the average velocity of the wind over the ocean being estimated at 18 miles per hour throughout the year.

In the summer of 1845, I instituted a series of experiments with a machine I had made, and with the results of which I was highly pleased; but other business interfering, I have never found it possible to renew my enquiries upon the subject. The worm with which I operated was of tin, a little over half an inch in diameter, and about 18 feet in length, having an inner surface of about $3\frac{1}{4}$ square feet. This pipe, being coiled, I set into a tub of water, the two ends extending above the surface. At each experiment the water in the tub was kept at a fixed temperature, and thus, with the worm immersed, we blew a current of air through the pipe, by means of a pair of common bellows. In this rude and laborious manner, we succeeded at all times in obtaining water from the atmosphere—the state of the *barometer* seemingly having no influence on this branch of philosophical enquiry. Some of these experiments were performed in the hot sunshine, and others in the shade.

I find from my notes, July 15, two trials. The condensing medium in the box was cooled by ice to 38° —the atmosphere being 83° . The produce of water, after working half an hour, was over half an ounce, or a good table-spoonful. Both trials were conducted under the same circumstances, and with equal results.

Again, August 10th—two experiments. The time of each operation was two hours. In the first, the condensing medium was spring water, at 54° , the atmosphere 77° —produce, $1\frac{1}{8}$ ounces of water. The air, after passing through the worm, was reduced to 61° , having lost 16° . Second experiment—Condensing medium reduced by ice, to 37° —atmosphere, 80° —produce, $2\frac{1}{8}$ ounces. The air at its exit, 49° ,

having lost 31° . Thus, from these last two experiments, I remark that it is not *proportionately* advantageous to reduce the temperature of the air to a very low degree, in passing through the worm—for observe, in the last mentioned trial, I reduced the air about double of the former, and only received $\frac{1}{16}$ by so doing, which establishes a very material point regarding practical operations on a large scale, viz: that to extract a few degrees of heat from the air of a high temperature, yields over double of the same reduction of a lower temperature; and further, that a condensing medium, such as I propose, may be obtained, and that frigorific mixtures are of little service. I do not propose to extract all the vapor that may be contained in the current of air through the machine, but only that portion contained in the higher numbers in the scale of temperature. Although I have mentioned only a few of my many experiments, I hope it will be evident that the plan is practicable, and I mention with pride, the obtaining from the hot air, under a burning sun, a full tumbler of pure water, in four hours, whilst my pipe had only the limited surface of $3\frac{1}{4}$ square feet, together with the disadvantage of an inland situation, where the moisture is more limited than at sea.

It was my original design that each ship should carry its own apparatus for obtaining fresh water, but from the conflicting statements regarding the cold existing a few feet below the surface, I have discarded the idea, and now advocate with confidence the plan which I have submitted to you.

The various currents in the ocean are likely so to affect the object at which we aim, owing to their difference of temperature, that I pointedly urge a good selection of situation. To illustrate this difference, take the Equatorial and the Guinea currents, which run parallel, but in contrary directions, upwards of 1000 miles, and differ in their temperature 10° or 12° .

I might insert a table of temperatures for both the air and the water, for all the different latitudes, but I deem it superfluous. Suffice it that the mean temperature of the air, the year round, both day and night, between the tropics, varies from 85° , which is at the equator, to about 77° at about the latitude of the tropics, and that however the thermometer may range, it is more regular over the ocean, and never rises as high at sea as on the main land.

The temperatures of the waters of the ocean, although less known, are nevertheless found to vary considerably. In the tropical seas, as well as in the temperate zones, the temperature diminishes in a geometrical progression, while the depth is taken arithmetically, and although the waters of the sea, in any latitude, or in any season, cannot exceed 86° , yet the bottom has often been found between 30° and 40° .

In conclusion, I consider a detailed proposal for further operations, having for its object the production, reproduction, or manufacture of water from the atmosphere, for the use of the shipping interest navigating the warmer seas, as inadvisable upon my part. Modifications can be made of my simple apparatus, to an indefinite extent, by concentrate tubes within each other, or otherwise, whilst the float may be of any size, so as to supply the shipping as a watering place, safe

from hostile shores and circuitous routes, &c. I would only add, that if this should meet with a favorable reception, I will be happy to add anything further that may have occurred in my experiments, and omitted here.

Philadelphia, December, 1847.

A Description of Col. Long's Composite Bridge. Secured, March 10, 1845, and Patented, November 13, 1847.

The Composite Bridge is so called from the fact, or circumstance, that it comprehends the principles of the Brace and Suspension Bridges, patented in 1839, combined and rendered co-operative in the truss-frames of a single bridge, and is composed of two or more single, double, triple, or quadruple truss-frames, stayed, supported, and strengthened, by the aid of such transverse and lateral braces, arch braces, flooring, &c., &c., as may be deemed most suitable for these purposes. This bridge is distinguished from other bridges heretofore invented and now in use, by certain differences and combinations in the arrangements and operations of its parts, which will be duly considered in the specification.

Each truss-frame of the Composite Bridge comprises the following parts, all composed of timbers of uniform, or nearly uniform, transverse dimensions, varying from one to four inches in thickness, and from six to fifteen inches in width, their respective lengths being variable, according to the positions they respectively occupy in the truss-frames. These parts are as follows, viz:—strings and splices; main suspensor braces; posts or vertical ties; main thrust braces; brace bolsters, or brace gluts; brace keys, or wedges;—together with such arch braces; lateral and transverse braces; flooring; roofing; bolstering; trenailing, &c., as have heretofore been employed in bridge building, or may hereafter be deemed expedient in structures of this nature.

The strings and their splices are similar in all respects to those employed in the suspension bridge before mentioned. (See description, vol. xxiv., 2nd series, page 325.)

The main suspensor braces are inserted in the truss-frame, in the same manner as specified in the patent for the suspension bridge before alluded to; (see description, vol. xxiv., 2nd series, page 327;) but are so arranged in their connexion with other parts of the truss-frame, that they are enabled to act both by *tension* and by *thrust*, or by either of these forces, according to the stresses or actions to which the posts and main thrust braces of the truss frame, are subjected. These braces are so arranged that they may act alternately as main braces, and as counterbraces, according as the exigencies of the case, or the stresses upon the bridge may require the one or the other of these actions.

NOTE. The main suspensor braces may be rendered *contractile*, by introducing, in connexion therewith, splicing pieces, gibs, keys, &c., after the manner observed in the application of these parts to the splicings of the inferior arch braces of the brace bridge, except that they are so arranged as to reduce, instead of increasing, the length of the braces. (Pl. IV., fig. 2, vol. xxiv.)