FOUNTAIN CAVE, VIRGINIA.

Though of much less extent than the Mammoth, Weyers, or other great caves which rank among the chief natural curiosities of the United States, Fountain Cave, in Augusta county, West Virginia, is remarkable for many singular as well as beautiful formations, interesting alike to the student of geology and the tourist for pleasure. We give on another page a series of illustrations, engraved from sketches made of the most prominent features, from which a most excellent idea may be gained regarding the curious freaks of Nature within the recesses of the cavern. Many of the most delicate and fascinating attractions are not of a character to be adequately represented, so that the sparkle of the incrustations and the myriad and ever changing forms of the stalactites and stalagmites must necessarily be left to be supplied by the imagination of the reader.

One of the most striking portions of the interior is "Panel Hall," peculiar both for its size as well as for the odd markings on its walls and roof, caused by the drippings from the rock. "Jefferson's Tobacco Barn" derives its name from a singular row of stalactites which resemble tobacco hung across a pole to dry. The "Tannery" has formations, the size of the largest side of leather, depending from the roof. "The Hanging Man" is a stalactite nearly seven feet long and located some ten feet above the floor, which, as will be seen from the illustration, looks very much like a suspended human body. "Pompey's Statue," a beautiful white formation about two feet in hight, on a pedestal twelve feet high, bears a striking resemblance, when the light is held in the proper position, to a figure in helmet and antique dress. The group of stalactites and stalagmites given in one of the smaller cuts, is about thirty feet in total hight and very beautifully marked. "The Elf's Bath" is a picturesque series of basins filled with pure sparkling water, in which it is easy to imagine that the elves or the gnomes which we read of in fairy lore may choose to disport.

Although the existence of the cave had been suspected for several years, it was not discovered until four years ago. It is located seventeen miles northeast of Staunton, on the Chesapeake and Ohio Railroad. Access to its interior has been made quite easy, and explorations may be conducted to a long distance from the mouth.

Correspondence.

The Transmission of Sound.

To the Editor of the Scientific American:

On page 177 of your journal is an account of the investigations of Professor Tyndall respecting the transmission of sound, and the varying distances at which the same sound can be heard. I have a theory that differs from his, which at the same time, I think, accounts for all the phenomena therein stated.

It is known that atmospheric air can hold a considerable quantity of watery vapor in suspension; but the amount depends directly on the temperature. For example, at a temperature of 30°, air will contain 2·2 grains of water per cubic foot without being saturated. At a temperature of 90° it will require 14·5 grains per cubic foot to bring it to the point of saturation, or dew point. It has been observed that, when the atmosphere is saturated with vapor and about to deposit dew, sounds can be heard at a great distance; whereas when it is devoid of moisture or far removed from the dew point, sounds can be heard but short distances; in other words, the ability of the atmosphere to transmit sounds is directly as its proximity to the point of saturation. The following case will illustrate: On a certain occasion the puffing or exhaust steam of a locomotive, in starting a train, was heard distinctly six miles. This occurred in the winter season and on a day when there was neither wind nor sun, and I am certain the atmosphere was near the point of saturation, for it was a dark, hazy morning, just before a misty rain storm. A few days subsequently, the same sound, over the same course, was entirely inaudible at a distance of three quarters of a mile. This, too, was on a cold, cloudy, still day, and the atmosphere must have been devoid of moisture, as it was a day in which electrical action could be readily excited by stroking the hair with a comb, or a garment with the hand; and it is well known that, in order to excite electrical action, there must be an entire absence of moisture.

This readily accounts for the phenomena of Professor Tyndall. He states that, on a hazy day, his fog horn could be heard twelve miles dead to windward, whereas on a clear, warm, sunshiny day, neither horn nor gun could be heard two miles. On the former day, it is evident the atmosphere was near the point of saturation; but on the latter day, the sun was shining hot. This would raise the temperature of the air and remove it from the point of saturation, as it requires a greater amount of water to saturate it at the high temperature. "But," he adds, "a cloud obscuring the sun, the sound began to be audible and became louder and louder till sundown, when it had increased fortyfold." It is evident that as the sun became obscured, the atmosphere began to cool, and therefore came nearer the dew point, and in that proportion the sound became more audible.

This theory can be verified by many ordinary observations. For example, it is known that sounds can be heard more readily at night than in the day time; and it is likewise known that the atmosphere is then nearer the dew point. It is also regarded by many that the hearing of sounds a great distance, as the running of trains, is a sign of an approaching storm, and this is only an indication that the atmosphere is becoming saturated with moisture. Violinists are also aware that, when electrical action can be excited, as by stroking the fur of animals, their instruments lack power; and that is only an indication that the atmosphere is devoid of moisture.

Respecting the theory of Professor Osborne Reynolds that sound is refracted or bent upward under certain conditions, it does not follow that such is the case, because sound is heard more distinctly from an elevated location than from one near he earth. If the observer be in an elevated place, besides the amount of sound passing directly to him, the earth would reflect a large additional volume. That could not be the case if the observer were near the earth, as the reflected sound would be intercepted by objects near the earth. Besides, if sound is refracted similarly to light, by certain varying temperatures, etc., why should light be refracted or bent downward, enabling us to see the sun before it has arisen and sound be, bent upward, as it would seem that similar causes should produce similar effects in both cases?

Professor Osborne Reynolds seems to have pretty clearly demonstrated that sounds can be more readily heard from an elevation than near the ground, and infers that the sound is bent upwards. But suppose, in the place of the sounding body, a loaded shell be placed and exploded. An observer in an elevated position would be much more likely to receive injury than one on the ground, not because the course of the fragments of the shell is bent upward as they radiate from the point of explosion, but because the force of the explosion seems to be directed more upward than horizontally, on account of the reactionary force of the earth.

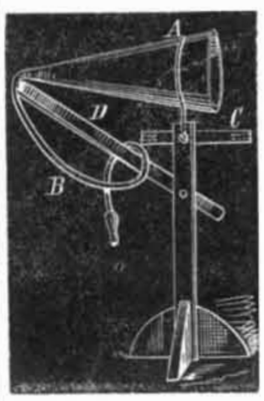
Bridgeport, Conn. F. G. FOWLER.

A Simple Ear Trumpet.

To the Editor of the Scientific American:

I am afflicted with deafness, so that I cannot hear a conversation carried on in an ordinary tone of voice. In order to assist my hearing, I have constructed an apparatus which enables ordinarily deaf persons to hear a lecture or a sermon, or to enjoy a theatrical performance.

The horn is made of paper (two thicknesses) with some ornamental paper covering the exterior and interior. It is shaped over a confectioner's "pyramid mold," of the hight of 18 or 20 inches, and width, at the large end, of about 15 or 16 inches.



At A, it is surrounded by a strong brass wire, of which one end is inserted into the upper end of the stand, which has a hole bored in it sufficiently large for the wire to act like a pivot. A flexible tube, B, of any desirable size, is attached to the small end of the horn, and ends in a mouthpiece of horn or gutta percha, connected with the ear. C is a cross piece with holes bored into each end which enables one, by turning, to elevate the horn, and D acts as a supporter and also as an elevator if desirable. The rest explains itself. As this simple device is probably not patentable, I give it to those unfortunates who are similarly afflicted.

Sacramento, Cal. JOHN EITEL.

The Spiral Theory of Physical Phenomena.

To the Editor of the Scientific American:

I once saw a juggler take a long cord, fastened at its further end a few feet above the floor, and by quick movements of the other end in his hand produce the appearance of a revolving spiral, having a pitch and diameter which varied at the will of the mover. I then thought and said: That suggests an explanation of the wave theory of sound and light.

Just now, in looking over Chambers' *Encyclopædia*, I came upon the article on sound, and was startled by the appearance of a diagram of the above described movement in explanation of the wave theory, but my eager search for an intimation of my screw theory was unrewarded; and I came home to copy the above description, and the following outline from a manuscript written a few months ago (although I have a sketch of the theory written in February, 1872); and I now present the idea for consideration and, as I confidently anticipate, verification.

Briefly, my suppositions are (1) that the ultimate ether molecules have a constant rotation upon their axes, with polarity; (2) that the intermolecular spaces contain the elastic magnetic fluid; (3) that any disturbance of their equilibrium occasions rather an accelerated axial rotation of the molecules with decrease of temperature, or a retarded rotation with increase of temperature; (4) that any change of initial molecular velocities is accompanied by a progressive rotation at right angles to the plane of the disturbing impulse; (5) that the actual progression is limited to the vicinity of the impulse, while the apparent progression continues until obstructed; (6) that the velocity of the helical revolutions, or progressions, is determined by the impulse, and continues in the same time for the same impulse; (7) that all observed phenomena are manifestations of personal presence and character in effecting the action and interaction of the fluid and the molecules, with and upon the cosmic dust. If hydrogen gas is a metal in particles, there can hardly be any particular objection to the word "dust" as generally descriptive of cosmic substances, in distinction from the ether and the fluid.

The formulated suppositions are, as you will observe, partly adopted and partly speculative, the theory arising in the described manner several years ago; from that time to this, my desultory reading and observation have often appeared strikingly to confirm my conjecture; and just now, as I read your articles of June 13 on "The New Theory of Quantivalence," and "Refraction of Sound," I for the hundredth time thought "my spiral theory makes these points clear; strange that some one does not see it!" When Mr. Proctor was lecturing in this city, I hastily put together these formula to bring them under his notice through one of our daily papers, but the editor was suddenly called out of town that morning, and the article slumbered in his drawer several days past the time when I wished it to appear. I reproduce it mainly now, and wish you to notice the coincidence between parts of it and the closing paragraph of your article on quantivalence.

In view of my inexperience as an experimenter, and want of knowledge as an investigator, I may appear presumptuous in my suppositions, but I fall back upon my inherited Yankee right to guess, even to the degree of thinking that physical facts generally will be found in accordance with the formula; while I venture particularly to suggest, for instance, that the string of a musical instrument does not vibrate, but does gyrate, and that the sound is due the given velocity of rotating helices of proper sized ether molecules in appropriate polar relations to the dust, suspended at a suitable temperature in the magnetic fluid. Reed, pipe, and vocal sounds are likewise gyratory, and are perhaps produced as water is twisted by angle of exit and friction on leaving the hydrant faucet; for example, in a flute, the high tones result from entrance at a proper angle, high velocity, small friction, and exit at a fine pitch of spiral, while the lower tones have different angles, lower velocities, greater friction and exit at a coarser pitch of screw; the trombone may be similarly explained, the "mouthing" consisting in giving the right twist and size to the rope of air.

Put a bright iron screw in rapid revolution, and you will have a striking illustration of the apparent movement of light in waves and emissions, light thus arising from a change in the velocities and other enumerated conditions of the molecules, and of the fluid and dust; and the phenomena of reflection, refraction, and polarization of light will soon find clear explanations on the spiral theory.

The solar spectrum with its Fraunhofer lines may thus be said to be an untwisting of the ray thread to show its colored strands, which also, being untwisted, throw out the entangled dust which casts its shadow lines across the field.

The electric current will also be found a helicoid, and the bare statement of this proposition is startling in its suggestion of many well known analogies which send in spiral thrills of quick succeeding sense, and the pleasing thought that now at last we have the clue long sought.

Whirlwinds and waterspouts need only to be mentioned to bring at once the thought of spirals, grand and awful, and waves may readily appear before the mind as formed by nearly horizontal screws, whose pitch, diameter, and speed decide if ripples, billows, or great water hills shall in procession move.

This given theory embraces the small and great, the general and particular, the seen and unseen; therefore it may be humbly anticipated that the displayed cross section of a cord of light would afford a clear illustration of all aerolites, asteroids, satellites, planets, suns, and stars, as viewed from the axis of the rotating helicoid Universe.

W. STORER HOW.

Foul Wells.

To the Editor of the Scientific American:

My well, though yielding in general very good water, will occasionally get foul both to taste and smell. I suppose all wells are liable to the same difficulty. Generally it results from some body, a potato or other vegetable, or (still worse) an animal substance, which has accidentally found its way into the water. But sometimes no cause is apparent. I use common wood charcoal, which I pound quite fine in a cloth bag and throw into the well—one or two quarts in quantity. But this, though efficient, and finally settling to the bottom, requires one or two days for the process, and will sometimes occasion inconvenience by choking up the valves of a pump connected with the well. If any of your readers practise a better method, I should be grateful for the information.

Being obliged to continue using the water in spite of its ill smell and taste, it occurred to me to boil it for five minutes. This I did at evening, boiling a bucketful for drinking the next day and allowing it to cool over night. The result was very satisfactory. The water was delicious—perfectly sweet and pleasant, even without ice.

Englewood, N. J. J. V. B.

The Growth of Timber.

To the Editor of the Scientific American:

I send you a small piece from my flagstaff, recently erected; before it was trimmed, its diameter was fourteen inches at the base, and its length sixty-six feet.

When you examine the closeness of its concentric rings 63 in three quarters of an inch, you will not be surprised to learn that it was 230 years growing, that is, that it was living in the time of Oliver Cromwell.

When we consider that the straight and tall growth of the pine depends on its being so crowded by other trees as to have all its foliage grow at the top, while the lower branches die for want of light and air, and that the ground room is insufficient to support roots enough for the growth of much top, we may conclude that the growth of the wood for a tall, straight tree must necessarily be very slow, and that many years are required to produce one of much thickness. If, then, such a small tree be two hundred and thirty years old, what must be the age of some used for large masts? Cannot some of your correspondents tell of some pine trees 500 or 1,000 years old? H. M. S.

[The concentric circles in the specimen are wonderfully, regular and close.—EDS.]