

Correspondence.

The Editors are not responsible for the opinions expressed by their correspondents.

[The subject of Perpetual Motion having been discontinued in these columns for the present, all articles received on this subject are placed on file, and may be referred to at some future time.]

Lunar Phenomenon.

MESSRS. EDITORS:—On the afternoon of Friday, February 3d, about a quarter before six o'clock I noticed, casually looking at the moon, as beautiful and rare a phenomenon as it has ever been my pleasure to behold. I thought at the time, and still think, it was a lunar rainbow, and if my description will justify my belief, it may be of sufficient interest to publish.

Lunar rainbows are undoubtedly very rare. I had never seen one before, and, after careful search, find no mention made of any. However, I think I recollect hearing of one seen at Brooklyn, perhaps a year or two ago, any record of which I have been unable to find.

The moon was nearly full, and at an angle of thirty degrees, or about one third risen toward the zenith. The evening was perhaps a little chilly, but quite clear, thin, fleecy clouds being scattered here and there. The moon itself was surrounded by a halo or belt of a light brown or chestnut color, for, perhaps, the distance of two radii directly adjoining the moon. Just outside of this again was another belt, of perhaps twice this width, and of a beautiful buff or golden color; and again, outside this, was a ring encircling the whole, the width of which was equal to both the others, resembling the beautiful transparent colors of a locust's wing.

The play of the prismatic colors of the rainbow in the outer ring—the green perhaps predominating, with an effect very like the light during an eclipse of the sun, *i. e.* without actinic force—was beautiful. It lasted for perhaps twenty minutes from my first observation, and, during that time, remained as I first saw it, until just before it disappeared, when it faded out very rapidly, beginning at its northwest limb, and continuing directly across to its south-west limb. When it had reached the center, it looked very much like a rainbow turned topsy-turvy, and, if anything, was the most astonishing and pleasing effect of the phenomenon. Actually a rainbow upset, or rather the lower half! I have never heard of such a thing before, nor can I find any similar phenomenon described. As it disappeared, a light hazy cloud drew off from the face of the moon, and, in a few minutes, the sky was clear and cloudless.

Can any of your readers give an explanation of this beautiful appearance, and whether it really was a lunar rainbow? Even if not, it was a beautiful and rare phenomenon, and I should have made a more extended and accurate view of it, had I been at leisure, or had an opportunity.

Dayton, Ohio

A. C. GRUBE.

Supply of Water to Boilers.

MESSRS. EDITORS:—The supplying steam boilers with water is a subject, I think, which has not been thoroughly considered; at least I have never seen anything in reference to the proper locality for its admission.

The practice is now, as it always has been, since steam was first used as a power, to admit the water at the *lowest* part of a boiler.

I think if the cause of this never varying practice should be investigated, it would lead to an improvement, in this matter, of no small importance.

Water, when taken into the legs of a boiler, or, in other words, into a water space formed round the ash box, will remain comparatively cold for a time, it being below the fire grate; and after it has become more or less heated, it is forced up into the body of the boiler by a new supply of cold water from the force pump taking its place. Now, this practice must cause a disagreement in the expansion and contraction in different parts of the boiler; and the forcing of water into the bottom of any form of boiler has this objection in a greater or less degree.

I think the water should be heated as soon as possible, on entering the boiler, and for this reason should be admitted continually, at a uniform rate with its consumption. It should be admitted a little *below* the upper surface of the water, for, on entering at this point, it would immediately flow towards the bottom of the boiler, and, passing through the heated water, and blending with it, would absorb heat much sooner than if admitted in a body against the fire-box.

I think it would be an advantage for the feed water to take its heat from a large space *within* the boiler, rather than from a small portion of the fire-box, for various reasons. It would be heated sooner, and therefore a more even heat would be preserved throughout the boiler. There would be less fluctuation in the steam, as it would be made much more uniformly. It would also mitigate the evil of unequal expansion.

A friend tells me there would be danger of admitting the feed water at the point above mentioned, as the water would sometimes get low, and then the feed water would be taken into the steam, and thereby converted into steam so suddenly as to explode the boiler.

Now, in such a case, the steam would be condensed in proportion to the water taking its heat; but the water in this case takes no more heat than if it had entered the hot water; but it takes this heat more suddenly, for the nature of steam is such that it comes in contact with *all* the particles of water at once, and causes a sudden condensation, which, by the action of the force pump, would cause a slight pulsation in the steam. This would be partly counteracted by the steam

made by the furnace at the same time; but this reaction would be slight, compared with what steam boilers frequently receive, especially where large steam hammers are used. But this never need occur.

The water in a steam boiler never should be allowed to get low; and it never would, if admitted as mentioned herein—namely, by a constant flow, in keeping with its consumption; and there is no reason why this should not be done.

Perhaps it would be well to extend the supply pipe into the boiler, and to inclose that part within the boiler, by a second pipe, so that the cold water may have no influence upon the shell of the boiler.

Water requires a certain amount of heat, varying with pressure, to convert it into steam, and from whatever part of the boiler the heat is derived, it will take no less; nevertheless, I think, for the reasons I have given, that it would be an improvement to supply the water as herein described.

I think there are many others who would be pleased to hear this matter discussed by some one of more scientific ability than myself.

WILLIAM DENNISON.

Philadelphia, Pa.

(For the Scientific American.)

RAMBLES FOR RELICS.

NUMBER I.

I am neither an antiquarian nor an archæologist, in pretension, and I lay no claim to appear in print as a "scientific American"; but, having a liking for old and curious things, which has led me, for the last two years, to look about and into earth works, mounds, shell heaps, stone piles, cave sepulchres, and other remains of the primitive people of Tennessee, I assume the privilege of recording in your journal some of my observations. The field of my late rambles is in Jefferson county, not far from the railway station, at Strawberry Plains. Near that village the Holston river, flowing from the East, turns in a northern direction, and, after accomplishing a circuit of five miles, comes back to within half a mile of its former course, shaping a tract of land known as "The Bent." The river is called Holston, according to Haywood, from the circumstance that an explorer of that name, from Virginia, in 1658, discovered it, and was one of the first settlers upon its banks. By the same authority, it was known to the Cherokees by the name of Watauga. Ramsey, however, calls it Hogohegee, from its source to its confluent French Broad (Agiqua), and Cootla below, to where it meets Little Tennessee (Tannasee). On an English map furnished for the use of British officers serving in America in 1766, the Holston is put down as the Kallamuckee, from its source to Little Tennessee. On Mitchell's map of 1776, the river now known as the Tennessee is the Hogohegee to French Broad; above, to its head, the Holston. This was the "storied" river of the Cherokees. Their fatherland lay beyond the "Big Mountain," (Allighanee). In the course of migration, their settlements were extended down French Broad and Little Tennessee to the principal river, forming the "Overhill" middle and lower towns.

My attention was directed to the Bent of the Holston, hearing that a stone image—not a "giant," but a dwarfed representation of the human form—had been discovered in a cave of one of the limestone ridges of the district. The idol (a real antique) was exchanged for a bushel of wheat, and sent to Knoxville; hence it passed through successive hands to Washington, and it now occupies a conspicuous place in the archæological cases of the Smithsonian Institute.

The ordinary relics of the ancient Cherokees, scattered in the valleys of the Tennessee and its tributaries, occur at the Bent; such as flint arrow and spear heads, axes, hatchets, cores, flakes, pestles, fragments of pottery, and rough, discoidal stones, called weights, used probably as rollers in a game of skill, described by the old trader and author, Adair. Rambling from this class of remains to those, left by the same race, I noticed traces of an arena, or chunkyard—a place of amusement and exhibition, where captives in war were sometimes immolated—within an elevation of earth a foot and a half high, inclosing a space twenty-five feet in diameter. In the center, in a plain raised above the surface, was a post hole, which had held the stake to which the victim was fastened. The area resembles "the ring" of a circus in the fields, after the covering is removed. It was an ancient inclosure, to judge by the depth of soil formed upon it; the ground had never been disturbed by the plow, and I am quite sure that Rice and Van Amberghe never presented the combined attractions of circus and menagerie in the face of gigantic trees two hundred years old. About twenty paces from the area, nature had provided a convenient space for spectators, on an inclined plane.

Objects of a higher grade of art than any that have been mentioned, which probably belonged to a different people, are sometimes turned up by the plow. Of such as were brought to me, after they had been thrown aside as worthless, but which rose astonishingly in their flight of valuation—many being too high to be reached by my short means—I specify a disk, with a round edge, cut in silicious rock, five inches in diameter and an inch and a half thick, having a shallow cavity in both of the flat sides, and a perforation in the center of the plane; a cup-shaped utensil of a fine variety of earthenware, coated with a dark, shining pigment which would be called glazing, if the art of the glazer had been known to the potters of the "Stone Age"; the imaged head and neck of a sea-duck, in argillite, evidently a fragment; and for a rare specimen of taste and skill in representing forms in stone, the combined figures of a pipe and bird—an orifice in the end, communicating with the bowl of the pipe on the back of the image.

The head and neck, in the outline, characterize a buz-

zard at rest, looking down upon its prey. Any one who has observed the traits of this species of hawk must acknowledge the resemblance. The object, which is sculptured in a fine variety of mica slate, is five inches long and weighs more than two pounds. It was found by a laborer, on the west bank of the Holston, at a point where the freshet of 1867 had washed away two feet of the surface soil.

On the east side of the river an ancient mound was observed in the Bent, near a curvature in the bank, which has been scooped out to form a beach or landing place. This had been occupied, evidently, by the recent Indians, for their misshapen earthenware in fragments, rough hatchets, and arrow heads, were found in the locality. There, without a flight of a century back, fancy might figure the warriors of the last tribe that roamed through the cane meadows of the Holston, assembled, before embarking in their canoes, for an onslaught down the river, into the "Creek country;" or, after their return from a successful expedition, with "fresh scalps."

Tradition spoke of a "town hall" or council house up on the mound, and a passage to the center, underground, from the river. Of the last, there were no signs. The occupancy, but not the erection, of similar structures, "artificial mounds" for public uses, by the Indians, is mentioned in the narratives of the earliest explorers of the country, now known as Tennessee.

Log or wood inclosures, in ruins, on hillocks made by art or on natural bluffs, are pointed out by persons living who remember that the natives described them as places for public meeting. The same race sometimes buried their dead in the mounds. This fact, in connection with the other, though it is important to the investigator, in ascertaining their character and in separating original from accidental deposits, need not confound him, as it has done some authors. Noah Webster supposed that some earthworks, which he examined at the West, were put up by the followers of De Soto, for fortifications. The annular evidence of certain trees, an evidence which is accepted in such instances by the highest authorities, throws the date of the construction beyond the time of this explorer.

Respecting the mound under our immediate notice, the "oldest inhabitant" reported that when his father drew the first furrow around it, large oak trees grew upon the summit. Being now without any protecting vegetation, and having been plowed over for seventy-five years, it has lost its original proportions. It retains the shape of a truncated cone, fifteen feet high, and one hundred and sixty-eight feet in circumference, at the base.

An excavation to the bottom, eight feet in diameter, showed its composition to be, chiefly, compacted sand-loam, with such an intermixture of clay as would come from the removal of surface soil with portions of the substratum. Two large pits or sink holes, hard by, probably contained some of the building material. From the cavity were thrown out, at intervals, for several feet down, charcoal, ashes, burned clay, and fragments of pottery.

The first regular deposit was reached at a depth of four feet, six or eight feet below the original summit. It consisted of splinters of wood and strips of bark partially decayed, laid horizontally. Beneath this layer, after the soft black earth and mold, in which it was embedded, were cut through, the outline of a human skeleton appeared, lying on the left side, the head being towards the east, and the leg bones doubled up on the chest, a position regarded, at first, as accidental, but which conformed to the mode of burial throughout the mound. The bed of earth rested upon a clay foundation, two or three square yards in extent.

The organic remains were well enough preserved to allow removal of the skull and the principal bones of the trunk and the members, entire. Below these remains, there appeared at various depths, from two to four feet, two or three skeletons on the same level, laid in the same manner, with a covering of wood and bark. Skeletons were found down to the bottom of the excavation—no particular position having been observed as to the cardinal points.

Parts of eight skeletons, including eight entire skulls, were removed. The absence of implements and utensils of various sorts was remarkable, in the burial place of a people known to have been in the habit of depositing with the dead their most valued effects. Fragments of earthenware, composed of a paste mixed with silicious particles or pulverized mussel-shells, alone rewarded my curiosity. I had observed in the wall of the cavity, four feet from the top, part of a cedar post three feet long, and four or five inches thick, set in an upright position.

My assistants, who could conceive of no other reason for my operations than a mercenary one (and who regarded the relic as a pointer to a pot of gold "hid by the Indians were they left the country," which had come to my knowledge by the spontaneous turning of the forked twig of an apple tree, held firmly by each hand, or by some necromancy of that sort), made extraordinary efforts to reach the treasure. The mattocks clanked upon some loose stones which were thrown out in such haste as prevented a thorough examination of the pile. Broken vessels, charcoal, burnt earth, ashes, shells, calcined bones of animals, among which were those of the deer, indicated that the structure was a hearth or fireplace, perhaps an altar of offering to the Sun, by fiery rites.

Without finding gold for an encouragement, our labors were renewed on the west side of the mound, by digging a trench ten feet wide, twelve feet long, and from twelve to fifteen feet deep, to meet the central opening. At the depths of five feet a layer of wood and bark covered the form of a child, apparently about six years old. It was laid with much care, perhaps by the hand of affection; a tortoise-shell covered the head, and a string of pearl beads encircled the neck. Three feet from the skeleton, in the same plane, one of a fe-