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 a rainbow turned topsy-turvy, and, if anything, was the most astoni hing 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 Cootcla 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 Ambergh 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 earthernware, 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 buzzard 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, fifteeen 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 female was exposed, and upon the sunken ribs lay the bones of an infant. Beads and a cruciform shell ornament were with these remains. Nearer the central cavity a rotten cedar post, like that which had excited the cupidity of the workmen, was observed, corresponding with others describing a rectangular figure. Within the space lay a skeleton on its side, doubled up in the usual manner, and distinguished by its size from all others exhumed during the excavations.

The skull was large and round. The intellectual development would have pleased Dr. Gall or Mr. Fowler. The maxillary bones had full rows of sound teeth; and those of the trunk and limbs must have belonged to a man of massive build, about six feet high. Ten large beads, perforated lengthwise through the center, cut from the column of a marine shell, eight flint arrow points of slender shape, and sharpened at the base to be fitted to the shaft, were found on one side of the skeleton; an implement of polished serpentine, which, I imagine, was the battle ax of the chief, whose mortal remains were under my observation, was on the other. The points, only an inch and a quarter in length, had the delicate shape and finish of a class of objects usually found only in the mounds. The rough and clumsy heads, chipped from flint and other quartz rocks, and scattered over the plain, do not occur among the primary deposits, in any of these structures.

The rotted cedar posts were signs of a mode of burial in wood enclosures, practiced by the ancient people. These were made not by hewing and fastening stakes, for their connections had no marks of the ax or the hammer, but by placing logs and pieces of timber one above the other against upright posts, so as to support a roof of the same material. Remains of similar vaults have been disclosed in other mounds, one of which was examined by myself at "The Forks" of the Holston and French Broad, and another near Chattanooga, opened during the late war. While I am writing, a publisher's account comes to me of a "visit to an Indian mound in East St. Louis," in which narrative "a square structure," with "sides lined with wood," "wooden columns," and "cedar posts" is mentioned.

In an earth mound opened near Newark, Ohio, in 1850, a trough covered with logs, contained the skeleton of a man. (Smithsonian Report, 1866.) A similar object was disclosed in a frame of wood, at the bottom of an ancient mound, by Squier and Davis.

In the further prosecution of our work, ten skeletons, invariably doubled, but laid without order as to their relative positions, under wood and bark, and portions of ten others were discovered, at various depths. Several skulls were obtained entire, and the bones of a single frame. The solid parts of most of the remains, having lost their animal consistency, easily crumbled. Eight feet down the cavity were the first signs of incremation. A layer of red clay, several yards square, covered a mass of earth, ashes, charcoal, charred bones, calcined shells, broken vessels, and carbonized seeds of a species of plant, probably the cane, the stalks of which had evidently been used in the burning. This layer rested upon another bed of clay, burnt to the hardness and color of brick. These were indications of a usage of the mound building race in Tennessee—burning their dead with their treasures, in connection with the carcass of a domestic animal or one of the chase. When the remains were partially burnt, earth was thrown upon the pile, smothering the flame, which had an extinguisher in the clay layer.

Various implements and ornamental articles found in this cavity, are to be described hereafter.

PROGRESS OF FOREIGN INVENTION.

SMELTING BY PETROLEUM.

A novel application of petroleum oils in smelting furnaces has just been patented in England by J. F. Parker and E. Sunderland, of Birmingham. The inventors take petroleum or other like volatile oil, and place it in an air-tight cistern surrounded with a covering or jacket, and into the said jacket they introduce boiling water, or, by preference, steam; or, by means of a coil of piping within the cistern, and under the surface of the oil, through which piping steam is passed, they raise the oil to the required temperature. They prefer a temperature of about 212° Fah. The top of the covering or jacket is provided with a self-acting valve regulated to the desired pressure. Through an inlet pipe, they pass a current of air over the surface of the petroleum or volatile oil, which air becomes thereby carburized or charged with the vapor of the oil. By an outlet pipe, they conduct the carburised air into a larger pipe entering the tweer of the blast furnace or cupola employed in the manufacture or melting of the iron or steel, which larger pipe constitutes a common conduit, into which all the gases and vapors, supplied to the furnace or cupola at the tweer, are passed, and by which they are conducted to the furnace or cupola. The inlet and outlet pipes are each provided with a tap. In a retort or close chamber, exposed to heat, the inventors place chloride of lime or bleaching powder, intimately mixed with about one eighth its weight of dry crushed charcoal, coke, or other carbonaceous matter. The object of the chloride of lime is not stated, but it is probably intended to dry the air passed into the hydrocarbon vapor.

TREATMENT OF MINERAL OILS.

This is a Scotch invention, and has for its object the removal of the objectionable blueness, cloudiness, or apparent turbidity which occurs in various mineral oils, and the invention consists in adding, to the mineral oil, a substance which is soluble in or mixable with the oil, and of the class known as nitro-compounds, and obtained by treating hydrocarbons with nitric acid. Nitro benzole is the substance of the class which is used, and the inventor finds that the commercial quality of it, which generally also contains other nitro compounds, answers the purpose. The proportion of nitro-benzole to be employed in each case will vary with the quality and condition of the mineral oil—in other words, with the more or less purified or refined state of the oil, and with the amount of blueness present.

CUTTING TOBACCO.

An English invention for the above purpose is intended to cut timber, tobacco, and various substances, not by a saw, nor by a knife pressing merely against the substance, but by a knife or knife edge made very sharp, and moved in the manner of a saw, so as, in fact, to constitute a saw, whether band, circular, or any other saw, but formed without teeth; and he applies a stationary sharpener, consisting either of a piece of hone, steel, or other suitable material, or of a succession of those pieces, to the edge of the moving knife, so as to make the knife edge rub against such sharpener set at a proper angle with the edge, whereby the edge is constantly sharpened in the same way in which any knife is sharpened on a hone, only that in this case the motion is continuous. The inventor employs circular, band, or reciprocating knives to cut timber and other substances, in substitution of saws, whereby the cutting is effected with the production of a smooth surface and without waste; and he also uses such knives or knife edges moving, not merely like a chopper, against the substance to be cut, endways like a saw, to cut tobacco and all kinds of fibrous or other similar substances requiring to be cut cleanly and without jagging.

DECOLORIZING SIRUPS.

The inventor of this process takes ethylic (common vinous) alcohol or methylic alcohol, known as wood spirit, or a mixture of these two, known as methylated spirit, and he adds, to the alcohol to be employed, either caustic ammonia or caustic soda, potash, or lithia, or any of their salts that have causticity and are soluble in the alcohols named. To the alcohol, thus rendered caustic, he adds impalpable charcoal, and heats up, in the case of the ammonia alcohol, to from 100° Fah. to 130° Fah. In the case of alcohol and the three fixed alkalies named, he heats to 180° Fah., using proper means and sufficient condensing power to prevent loss of material.

PUDDLING FURNACES.

The object of this invention, patented by J. Russell, of Cinderford, England, is to protect puddlers from heat. The invention supports, parallel to and at a short distance from the front of the furnace, three vertical screens, two of the said screens covering the front of the furnace, on either side the puddling door, and the third screen nearly covering the said door, the hole in the door through which the puddlers' rabble passes being left exposed. Each screen is made, by preference, of a plate or slab of cast or wrought iron. The edges of the middle screen or plate project over the inner edges of the side screens or plates, and the said middle screen is supported by a chain passing over pulleys, and provided with a counterbalance weight. The side plates or screens are supported, in front of the furnace, by being hooked or otherwise fastened thereto. The heat radiated from the furnace, at that side on which the puddler stands during the puddling operation, is received upon, and absorbed by, the screens or plates described, and the said puddler is thus protected from the distressing heat of the said furnace.

IRON TUBES.

The following method of making iron tubes is the invention of H. Kesterton, of Birmingham, England. In making the tubes, the inventor reduces pig iron to the state of soft malleable iron by the Bessemer or other similar process, and casts it into a hollow cylindrical ingot. He passes this ingot, whilst still very highly heated, through a series of pairs of grooved rollers set in different planes, say alternately vertical and horizontal. The first pair of rolls takes the ingot, and reducing and elongating it, passes it to the second pair immediately beyond, and this pair passes it to a third pair, and so on, until the desired reduction is obtained. Each successive pair of rolls is driven at a surface speed greater than that of the rolls immediately in front, so that allowing for the elongation of the tube and the reduction of the section, equal quantities of metal may pass between all the pairs of rolls, gripping the ingot in equal times. A stationary mandrel passes between all the rolls, and carries a bulb at the nip of each pair of rolls.

DYERS' RECIPES.

From Haserick's Secrets of Dyeing.

DARK BLUE SUITABLE FOR THIBETS AND LASTINGS.—Boil 100 pounds of the fabric for one hour and a half in a solution of 25 pounds of alum, 4 pounds of tartar, 6 pounds of mordant, 6 pounds of common extract of indigo; cool them as usual. Boil in fresh water from 8 to 10 pounds of logwood, in a bag or otherwise, then cool the dye to 170° Fah. Reel the fabric quickly at first, then let it boil strongly for one hour. This is a very good imitation of indigo blue. Chemic can be used in the preparation; but should the shade require more of the indigo while finishing in the logwood, extract of indigo ought to be used.

The old English way of coloring a blue-black on lastings, is by boiling 100 pounds of the fabric for one and a half hours in a solution of 10 pounds of alum, 1 pound of copperas, and 1 pound of blue vitriol; take the goods out, cool them, and boil them for one hour in a dye containing 10 pounds of logwood. This color would not look well on soft goods, such as thibets, as in fact it is only a dark slate but it looks better on lastings, on account of its gloss.

N. B.—To all these colors the logwood can be boiled in large quantities, say a barrelful in a hogshead of water at a time, 2 pounds of logwood being reckoned to a pail of liquid. This will save boiling the chips in a bag. Five pails will be equal to 10 pounds of chips. It has this advantage, too: more can be easily added if the shade require darkening. Extract of logwood should never be used for blues, as it will produce dull colors on account of its being disoxidised by time.

SAXON BLUE.—100 pounds of thibet or comb yarn, 20 pounds of alum, 3 pounds of cream of tartar, 2 pounds of mordant, 3 pounds of extract of indigo, or 1 pound of carmine instead; the latter makes a better color. When all is dissolved, cool the kettle to 180° Fah.; enter and handle quickly at first, then let it boil half an hour, or until even. If the fabric be not scoured clean, it will look shady; and about 5 pounds of common salt added will remedy this. Remember, long boiling dims the color. Zephyr worsted yarn ought to be prepared first by boiling it in a solution of alum and sulphuric acid, then the indigo added afterwards. For common coarse carpet yarn, it is only necessary to handle it through a hot dye of 175° Fah., containing 15 pounds of alum 10 pounds of sulphuric acid, 4 pounds of chemic paste, to 100 pounds of yarn, or through its equivalent of extract of indigo. If chemic be used, the dye ought not to come to a boil, otherwise the impurities of the indigo will color the yarn and dull its brilliancy. Rinse well in water before drying. The tin acid fastens the color somewhat. It will not fade so easily, nor run into the white, if wove into flannels, which have to be scoured in soap, and bleached. The color changes in the sulphur house into a stone green shade, but the original color comes back again when the fabric is rinsed again in water.

PRUSSIAN BLUE.—Prussiate of potash was formerly only used on cotton, with a preparation of iron first; and, about the year 1828, was first used on woolens, and, of course, no one then thought that they could be colored without giving the fabric a preparation of iron, before entering into the prussiate of potash solution. Every dyer had his preference to one or the other solutions of iron; they were nitro-muriate of iron, acetate, and tartrate of iron. Some used iron oxide (burnt copperas) dissolved in sulphuric acid, etc.; but later, the yellow prussiate was only used until the introduction of the red prussiate of potash. The latter has the preference, as it can be added, for darkening the shade while in the process of coloring, which is not the case with the yellow prussiate of potash; but this would rot the cloth, as this color requires a large quantity of acid. To 100 pounds of wool or flannel dissolve 8 pounds of red prussiate of potash, 2 pounds of tartaric acid, 2 pounds of oxalic acid, 5 pounds sulphuric acid. Handle the fabrics in this for half an hour at 120° Fah.; then reel the goods out, and heat to about 165 Fah.; add 5 pounds of sulphuric acid, and 1½ pounds of tin crystals; stir all well; enter the goods, and handle for half an hour longer; then heat it to 208° Fah., when it will be a good blue. The shade can be varied to any extent by the addition of logwood liquor and a few pounds of scarlet spirit; but the liquid ought to be cooled first, and the goods handled quickly to secure evenness while in the logwood. This color ought never to boil, especially when coloring with steam, as more than boiling heat (212°) destroys the color and makes it lighter; but letting the fabrics lay a few hours exposed to the oxygen before rinsing is an improvement to the color. This color must be well washed or else it will smut. This blue will be brighter if aniline purple be used for darkening, instead of logwood; but this ought to be done after the goods have been washed, and in fresh water. If a mordant of 10 pounds nitric acid, 36° B., 10 pounds muriatic acid, 22° B., 10 pounds sulphuric acid, 66° B., diluted with water, and 1 pound feathered tin added, be used, instead of sulphuric acid, the color will be fast.

ANILINE BLUE.—To 100 pounds of fabric dissolve 1½ pounds of aniline blue in 3 quarts of hot alcohol; strain through a filter, and add it to a bath of 130° Fah.; also 10 pounds of Glauber's salts, and 5 pounds of acetic acid. Enter the goods, and handle them well for twenty minutes; then heat it slowly to 200° Fah.; then add 5 pounds of sulphuric acid diluted with water. Let the whole boil twenty minutes longer, then rinse and dry. If the aniline be added in two or three proportions during the process of coloring, it will facilitate the evenness of the color. The blue, or red shade of blue, is governed by the kind of aniline used, as there is a variety in the market. Hard and close wove fabrics, such as braid, ought to be prepared in a boiling solution of 10 pounds of sulphuric acid and 2 pounds of tartaric acid before coloring with the aniline, as this will make the fabric more susceptible to the color. Blues soluble in water color more easily than those which have to be dissolved in alcohol.

Colored Fires.

A member of the German artillery corps gives the following formulæ for making colored fires:

1. White light: 8 parts saltpeter, 2 parts sulphur, 2 parts antimony.
2. Red light: 20 parts nitrate of strontia, 5 parts chlorate of potash, 6½ parts sulphur, 1 part charcoal.
3. Blue light: 9 parts chlorate of potash, 3 parts sulphur, 3 parts carbonate of copper.
4. Yellow light: 24 parts nitrate of soda, 8 parts antimony, 6 parts sulphur, 1 part charcoal.
5. Green light: 26 parts nitrate of baryta, 18 parts chlorate of potash, 10 parts sulphur.
6. Violet light: 4 parts nitrate of strontia, 9 parts chlorate of potash, 5 parts sulphur, 1 part carbonate of copper, 1 part calomel.