and delicacy of finish. Among the heaviest are some from three to four tuns in weight each, while there are thousands of others not exceeding four or eight ounces.

The conservatory has two floors or crypts, extending entirely beneath it. The lower one receives a supply of fresh air through a perforated stone screen facing the grounds, and forms the cold air chamber. Above this is a second space of equal area, divided from the lower one by a stone floor. The upper space contains a coil of ten pipes of 4 in. diameter, the coil being about 100 ft. in circumference, and giving over 1000 square feet of heating surface. The ceiling of this upper or hot-air chamber is covered by 5 in. York flags, laid on rolled iron beams. On the upper surface of these flags the tesselated floor of the conservatory is laid. Ten large slide valves (all connected by a rack and pinion) admit cold air from the chamber below at equidistant parts to the surface of the hot water pipes. After passing over and among these pipes, the air enters the conservatory through numerous perforated brass panels, in such quantities as may be desired. Massive brick piers pass through these floors, and support the sixteen columns on which the upper part of the structure rests.

The conservatory is formed with a large square central area surmounted by a dome. On each side of the square there are bays or transepts, the entrance to which is beneath three arches, rising to a height of 14 ft., and resting on columns, of which there are sixteen. The dome is formed of rolled iron ribs, meeting together in the center and united to a large pendant perforated boss; the ribs (40 in number) are separated by extremely light iron ornamental casting, forming a framework which is glazed with stained glass, which encircles the dome in three distinct bands; exterior to this stained glass is a plate-glass covering, each plate being curved to the true shape of the dome; the plates are each 7 ft. long, the joints so arranged as to be rendered invisible behind the stained glass panels; the glass is ground on both sides, and embossed in a bold trellis pattern, giving to the whole a most beautiful effect. The employment of ground glass for the dome gives it an apparent solidity when viewed externally from the terrace that surrounds the building, which much increases its architectural beauty. The dome, which is 40 ft. in hight, rests on a series of bold trusses, springing from the sills of the upper windows, and forming a division between them; these trusses are perforated on all sides, and are highly ornamented. The ceiling of the central part surrounding the dome is formed into deep soffits, each filled with elaborately designed perforated gilt panels, with an azure background formed by the flat iron roof above them. In the upper part of the central space there are six windows on each side, each one composed of a single sheet of ground plate glass, engraved and painted in pale tints. These windows all open by an ingenious contrivance worked by an attendant from the cold-air chamber below, which is sufficiently lofty to admit of ready access.

The iron columns have a spiral groove running around them, in which small spheres are fitted, by stringing them on a copper wire, giving an effect which simple casting could never accomplish; these spheres are all gilt, and give to the fresh gray tint of the columns a great relief; the capitals are all built up with separate acanthus leaves of very light and elegant form, and are also gilt. The arches, which rest on these columns, are all double castings, placed back to back. and are most exquisitely molded in a perforated pattern, through which the light falls in ever varying clusters of rays as one walks about the conservatory. There are thousands of rosettes on these perforated screens, all cast separately, and screwed in place, so as to get a bold relief, well undercut, an effect which founding in mass could not have.

The external walls are pierced with large circular-headed windows, glazed with a single sheet of plate glass, with a small Greek border etched around the edge, and narrow margins of colored ground glass of a soft gray tint etched in patterns. The walls are entirely incased with polished marble in pieces so large as to show no joints. A richly-molded architrave of red Devonshire marble surrounds each window and door, and relieves by its warm color the spaces between the windows, which are of dark Bardillo marble, against which are placed three-quarter columns of white veined Sicilian marble. The shafts of all twenty-four columns and the angle pilasters are 10 ft. in length, each in a single piece, and surmounted by capitals carved in white Carrara marble. Above these is a rich entablature of veined Sicilian marble running over the Bardillo, which is ornamented over each window and door, with a rich incised pattern of arabesque scroll work gilt in all the sunk part. The whole of the marble work was executed by Mr. Hartley, of Pimlico. One bay or transept forms the end of the adjoining drawing room, having two glass doors and a window between looking into it. It is from this window that the view was photographed which we have engraved. The right-hand bay abuts on a billiard room, having a central door and two large windows looking into it; and opposite to this are two similar windows, and a central door leading on to a raised terrace, 90 ft. in length, paved with squares of black and white marble, and extending all along the garden front of the house. The fourth bay is also divided by three equal arches, in each of which there are mirrors of 14 ft. high by 7 ft. wide, passing down below the floor line, and thus continuing the pattern of the pavement. These mirrors are silvered by a deposit of pure silver, and are not easily injured like those coated with tin-foil and mercury. They are kept warm at the back by a hot-air chamber, which prevents any deposition of moisture on them; they thus, at all times, reflect clearly the whole interior of the building, giving it apparently double its real size. Around the sides of the building are raised spaces for the flowers, having a sort of dwarf screen of polished dove-colored marble, in which are numerous gilt brass panels for the supply of warm air from the chamber below. In the central space beneath the dome is a large basin, richly molded in beautiful veined Bardillo marble, with four pedestals of the same material at the angles, which serve to support vases of white marble, containing some beautiful specimen plants. The basin is filled with rare exotic ferns, and has a fan palm in the center. Eight similar marble pedestals are also formed in the dove marble screen before named, on which are some choice specimens of Majolica vases by Minton, and two from Sèvres, and containing rare plants. Pendant from the ceiling are six Majolica flower baskets containing choice ferns and other drooping foliage. There are also eight suspended Roman lamps in bronze, with lotus leaves forming clusters of flowers in gas jets, and also four other suspended Roman lamps of classical design, giving in all eighty gas burners, by means of which the whole building may at night be brilliantly illuminated; there are also near the drawing room door a pair of exquisitely chased bronzed candelabra, which on ordinary occasions give sufficient light for walking in the evening. The floor is composed of encaustic tiles and tessera tastefully arranged in panels of quiet colors (so as not to interfere with the brilliant colors of the flowers). In this design are embodied mosaics representing Spring, Autumn, Summer, and Winter, and a fifth near the entrance represents Old Time with the date of the erection of the building on a table beneath him; this beautiful floor was erected from designs prepared by Messrs. Simpson, the London agents for Maw's encaustic tiles; at each of the four angles of the central part are life-size figures of boys executed in biscuit china at Sèvres, they represent Love, Pleasure, Folly, and Repose; they are exquisitely modeled, and of a pure white, standing against the rich crimson background of the niche, and supported by pedestals of Devonshire marble.

At six different parts there are semicircular spaces left above the doors or windows, and these are filled by spirited groups of chubby children in alto relievo, modeled by Wynn, and executed in copper bronze by Messrs. Elkington. It is only fair to add that much of the richness of effect and real beauty of the whole is due to the excellent taste of the decorator, Mr. Schmidt, who has managed to give a rich glow of effective color and gilding, without in any way lessening the natural beauty of the flowers and foliage.—*Engineering.*

BELLS AND BELL TOWERS.

[From the Contemporary Review.]

The long, winding staircase seems to have no end. Two hundred steps are already below us. The higher we go the more broken and rugged are the stairs. Suddenly it grows very dark, and clutching the rope more firmly we struggle upwards. Light dawns again, through a narrow Gothic slit in the tower—let us pause and look out for a moment. The glare is blinding, but from the deep, cool recess a wonderful spectacle unfolds itself. We are almost on a level with the roof of a noble cathedral. We have come close upon a fearful dragon. He seems to spring straight out of the wall. We have often seen his lean, gaunt form from below—he passed almost unnoticed with a hundred brother gurgoyles—but now we are so close to him our feelings are different; we seem like intruders in his lawful domains. His face is horribly grotesque and earnest. His proportions, which seemed so diminutive in the distance, are really colossal—but here everything is colossal. This huge scroll, this clump of stone cannon-balls, are, in fact, the little vine tendrils and grapes that look so frail and delicately carven from below. Amongst the petals of yonder mighty rose a couple of pigeons are busy building their nest; seeds of grasses and wild flowers have been blown up, and here and there a tiny garden has been laid out by the capricious winds on certain wide stone hemlock leaves; the fringe of yonder cornice is a waste of lilies. As we try to realize detail after detail the heart is almost pained by the excessive beauty of all this petrified bloom, stretching away over flying buttresses, and breaking out upon column and architrave, and the eye at last turns away weary with wonder.

A few more steps up the dark tower, and we are in a large dim space, illuminated only by the feeblest glimmer. Around us and overhead rise huge timbers, inclining towards each other at every possible angle, and hewn, centuries ago, from the neighboring forests, which have long since disappeared. They support the roof of the building. Just glancing through a trap-door at our feet we seem to look some miles down into another world. A few foreshortened, but moving specks, we are told are people on the floor of the cathedral, and a bunch of tiny tubes, about the size of a pan-pipe, really belong to an organ of immense size and power. At this moment a noise like a powerful engine in motion recalls our attention to the tower. The great clock is about to strike, and begins to prepare by winding itself up five minutes before the hour. Groping amongst the wilderness of cross beams and timbers, we reach another staircase, which leads to a vast square but lofty fabric, filled with the same mighty scaffolding. Are not these most dull and dreary solitudes—the dust of ages lies everywhere around us, and the place which now receives the print of our feet has, perhaps, not been touched for five hundred years? And yet these ancient towers and the inner hights and recesses of these old roofs and belfries soon acquire a strong hold over the few who care to explore them. Lonely and deserted as they may appear, there are hardly five minutes of the day or night up there that do not see strange sights or hear strange sounds. As the eye gets accustomed to the twilight, we may watch the large bats flit by. Every now and then a poor lost bird darts about, screaming wildly like a soul in purgatory that cannot find its way out. Then we may come upon an ancient rat, who seems as much at home there as if he had taken a lease of the roof for ninety-nine years. We have been assured by the carillonneur at Louvain that both rats and mice are not uncommon at such considerable elevations.

Overhead hang the huge bells, several of which are devoted to the clock—others are rung by hand from below, while somewhere near, beside the clock machinery, there will be a room fitted up, like a vast musical box, containing a barrel, which acts upon thirty or forty of the bells up in the tower, and plays tunes every hour of the day and night. You cannot pass many minutes in such a place without the clicking of machinery, and the chiming of some bell—even the quarters are divided by two or three notes, or half-quarter bells. Double the number are rung for the quarter, four times as many for the half-hour, while at the hour, a storm of music breaks from such towers as Mechlin and Antwerp, and continues for three or four minutes to float for miles over the surrounding country.

The bells, with their elaborate and complicated striking apparatus, are the life of these old towers—a life that goes on from century to century, undisturbed by many a convulsion in the streets below. These patriarchs, in their tower, hold constant converse with man, but they are not of him; they call him to his duties, they vibrate to his woes and joys, his perils and victories, but they are at once sympathetic and passionless; chiming at his will, but hanging far above him; ringing out the old generation, and ringing in the new, with a mechanical, almost oppressive regularity, and an iron constancy which often makes them and their gray towers the most revered and ancient things in a large city. The great clock strikes—it is the only music, except the thunder, that can fill the air. Indeed, there is something almost elemental in the sound of these colossal and many-centuried bells. As the wind howls at night through their belfries, the great beams seem to groan with delight, the heavy wheels, which sway the bells, begin to move and creak; and the enormous clappers swing slowly, as though longing to respond before the time.

At Tournay there is a famous old belfry. It dates from the twelfth century, and is said to be built on a Roman base. It now possesses forty bells. It commands the town and the country round, and from its summit is obtained a clear view of the largest and finest cathedral in Belgium, with its five magnificent towers. Four brothers guard the summit of the belfry at Tournay, and relieve each other day and night, at intervals of ten hours. All through the night a light is seen burning in the topmost gallery, and when a fire breaks out, the tocsin, or big bell, is tolled up aloft by the watchman. He is never allowed to sleep—indeed, as he informed us, showing us his scanty accommodation, it would be difficult to sleep up there.

On stormy nights a whirlwind seems to select that watchman and his tower for its most violent attacks; the darkness is often so great that nothing of the town below can be seen. The tower rocks to and fro, and startled birds dash themselves upon the shaking light, like sea birds upon a lighthouse lantern. Such seasons are not without real danger—more than once the lightning has melted and twisted the iron hasps about the tower, and within the memory of man the masonry itself has been struck. During the long peals of thunder that come rolling with the black rain clouds over the level plains of Belgium, the belfry begins to vibrate like a huge musical instrument, as it is; the bells peal out, and seem to claim affinity with the deep bass of the thunder, while the shrill wind shrieks a demoniac treble to the wild and stormy music.

All through the still summer night the belfry lamp burns like a star. It is the only point of yellow light that can be seen up so high, and when the moon is bright it looks almost red in the silvery atmosphere. Then it is that the music of the bells floats farthest over the plains, and the postillion hears the sound as he hurries along the high road from Brussels or Lille, and, smacking his whip loudly, he shouts to his weary steed as he sees the light of the old tower of Tournay come in sight. Bells are heard best when they are rung upon a slope or in a valley. The traveler may well wonder at the distinctness with which he can hear the monastery bells on the Lake of Lugano, or the church bells over some of the long reaches of the Rhine. Next to valleys, plains carry the sound farthest. Fortunately, many of the finest bell-towers in existence are so situated. It is well known how freely the sound of the bells travels over Salisbury Plain. The same music steals far and wide over the Lombard plains from Milan Cathedral; over the Campagna from St. Peter's at Rome; over the flats of Alsatia to the Vosges Mountains and the Black Forest from the Strasbourg spire; and, lastly, over the plain of Belgium from the towers of Tournay, Ghent, Brussels, Louvain, and Antwerp. The belfry at Bruges lies in a hollow, and can only be seen and heard along the line of its own valley.

To take one's stand at the summit of Strasbourg Cathedral at the ringing of the sunset bell, just at the close of some effulgent summer's day, is to witness one of the finest sights in the world. The moment is one of brief but ineffable splendor, when, between the mountains and the plain, just as the sun is setting, the mists rise suddenly in strange sweeps and spirals, and are smitten through with the golden fire which, melting down through a thousand tints, passes, with the rapidity of a dream, into the cold purples of the night.

Pass for a moment, in imagination, from such a scene to the summit of Antwerp Cathedral at sunrise. Delicately tall, and not dissimilar in character, the Antwerp spire exceeds in hight its sister at Strasbourg, which is commonly supposed to be the highest in the world. The Antwerp

spire is 403 feet high from the foot of the tower. Strasbourg measures 468 feet from the level of the sea; but less than 403 feet from the level of the plain. By the clear morning light, the panorama from the steeple of Notre Dame at Antwerp can hardly be surpassed. One hundred and twenty-six steeples may be counted, far and near. Facing northward, the Scheldt winds away until it loses itself in a white line, which is none other than the North Sea. By the aid of a telescope ships can be distinguished out on the horizon, and the captains declare they can see the lofty spire one hundred and fifty miles distant. Middleburg at seventy-five, and Flessing at sixty-five miles, are also visible from the steeple. Looking towards Holland, we can distinguish Breda and Walladuc, each about fifty-four miles off.

Turning southward, we cannot help being struck by the fact that almost all the Belgian towers are within sight of each other. The two lordly and massive towers of St. Gudule's Church at Brussels, the noble fragment at Mechlin, that has stood for centuries awaiting its companion, besides many others, with carillons of less importance can be seen from Antwerp. So these mighty spires, gray and changeless in the air, seem to hold converse together over the heads of puny mortals, and their language is rolled from tower to tower by the music of the bells. "*Non sunt loquellæ neque sermones audiantur voces eorum.*" ("There is neither speech nor language, but their voices are heard among them.") Such is the inscription we copied from one bell in the tower at Anvers, signed "F. Hemony, Amstelodamia (Amsterdam), 1658.

AN INTERESTING SKETCH OF THE DISTINGUISHED AERONAUT, JOHN LA MOUNTAIN.

The following sketch of La Mountain is from the pen of George Demers, of the Albany *Evening Journal*. Mr. Demers accompanied him in six of his balloon voyages:

John La Mountain was not an ordinary man, and his death calls for something more than a passing mention. Though deficient in those advantages which are imparted by early education, he possessed marked natural genius, great resoluteness of purpose, and much inventive ability; qualities that in other spheres might have won him success in life, but which, devoted with enthusiasm to the profession of balloonning, got him fame only as an eccentric and intrepid adventurer.

La Mountain did not become an aeronaut for the purpose of the mountebank exhibitor. His necessities compelled him to make ascensions for public amusement. His higher object was to render aerial navigation of practical use in the great enterprise of modern progress and commerce. He never was a convert to the belief that balloons could be propelled in any direction at will, and in despite of adverse currents, by the aid of machinery. But he early became satisfied that there is a current in the atmosphere corresponding with the Gulf stream in the ocean, and flowing steadily over a very wide belt, from west to east. His own experience and that of others, amply confirm this opinion. He concluded then, that as balloons had been kept in the air for many hours at a time under ordinary circumstances, it was possible, by making one of superior capacity, to mount into this upper current, float with it across the ocean, and land at will, for instance in England, in sufficient proximity to London to make the voyage of immense value, in the saving of time it would accomplish. Acting upon these ideas, he was determined to be the first aeronaut who should cross the Atlantic.

So soon as he could obtain sufficient means by his exhibitions, Mr. La Mountain began the construction of a balloon in which he hoped to accomplish his daring scheme. Everything about it was most perfect. The silk, of extra quality, was manufactured expressly for him, and under his supervision, by the Messrs. Ryle, of Paterson, N. J. The rope for netting he made himself at a factory near Troy, subjecting every fiber and strand to severe tests. Great care was used in oiling and coating the silk. Adroit mechanism insured absolute control of the valves. When the "Atlantic" was completed, it was undoubtedly the strongest and most symmetrical, as well as the largest balloon ever floated in any country.

By way of demonstrating the feasibility of his plan, Mr. La Mountain determined upon a preliminary land voyage of great length. St. Louis was fixed upon as the starting point, and he ascended from that city in the presence of an immense concourse, accompanied by John Wise, the veteran Pennsylvanian aeronaut.

The voyagers remained in the air a little over nine hours, during which time they crossed Lake Erie at its largest part, and traveled far into New York State. Unfortunately, in crossing Lake Ontario, they descended for purposes of observation, and became involved in a tremendous tornado of which they had no knowledge when above. This bore them with frightful velocity to the shore, and left the balloon a wreck in the woods of Adams, Jefferson county. In a little more than nine hours the "Atlantic" had traversed a distance of eleven hundred and eighty miles.

Thus ended, for a time, all prospect of the voyage to England. La Mountain was saddened, but not discouraged. All he lacked was money. To obtain this, he resumed his career as an exhibitor. A small balloon was constructed of the fragments of the wrecked "Atlantic." The citizens of Watertown made him a generous subscription, and he started on a pleasure trip from that place, in company with Mr. John A. Haddock, then editor of the Watertown *Reformer*.

The incidents of this voyage will long be remembered. The balloonists had proposed to be back in a few hours. But days passed, and they did not come. Time lengthened and there were no tidings from them. First was uncertainty then doubt, then despair in the minds of friends. All sorts of wild stories and vague speculations were started. The tragic fate of poor Thurston was then fresh in the public mind, and the belief became general that La Mountain and his companion had met a similar death; although there were some wild enough to believe that the insane venture of crossing the Atlantic in a small and unreliable balloon, had been made. At last the mystery was explained. Having no compass, the aeronauts had lost their bearings, and suffered themselves to be carried far into the dense woods of the Ottawa reservation, in Canada. After wandering in their blank mazes for many days, subsisting upon leaves and berries, they were accidentally discovered when in the last stages of starvation, by some Indian scouts in the employ of Mr. Cameron, a lumberman, and thus saved from a horrible death. Their thrilling story was widely published, and graphically pictured by the illustrated newspapers.

After this second misfortune, Mr. La Mountain did not at once renew his Atlantic project. The war of the rebellion began to assume large proportions, and La Mountain was at different times stationed at Cloud's Mills, near Alexandria, at Fortress Monroe, and elsewhere. So long as the armies were lying in camp, as they did during the early portion of McClellan's remarkable career, balloons were of some value.

We last heard of him in public as making an ascension from a town in Michigan. An impatient and careless crowd cast him off before he was ready, without an overcoat or instruments, and the valve rope tied several feet above the basket. He shot like a rocket up into a cloud of mist and sleet, which congealed his blood and froze the valve board fast before he could control it. His only alternative was to climb, with frost-bitten fingers, up the net-work and tear the balloon with his teeth. The rip extended above the hemisphere, the balloon collapsed, discharged its gas, and fell with great velocity from a hight of nearly two miles. The aeronaut was picked up benumbed, insensible, but not dangerously injured. Undoubtedly, the suffering and exposure endured at this time hastened his death.

The career of Mr. La Mountain was peculiarly one of danger and ill fortune. But he faced hazards without a tremor, and endured disaster without a murmur; never faltering in devotion to his leading idea. We accompanied him six times above the clouds, and saw him twice under circumstances of great peril, when he was as calm and collected as if sitting in a parlor—not a muscle relaxing nor a fiber quivering. His fault was a lack of business practicality. But he made up for this, in a great degree, by intense enthasiasm and earnestness. Notwithstanding the success of the Atlantic telegraph had rendered the question of crossing the ocean with balloons less interesting and important than formerly, we believe he would have made the attempt; and in this day of almost marvelous achievements, it is not wise to say that he would have failed.

MINERAL DEPOSITS.

[Lecture by William T. Brigham, before the Boston Society of Natural History.]

The deposits of minerals, the extraction of which forms the subject of mining, are found in two forms; beds originally more or less horizontal, and veins. The form in which a mineral is found is usually the same; thus coal is generally deposited at the bottom of fresh water and appears as a bed. The only other mineral of importance, if we except rock salt, found in this form, is bog iron. This ore is one of the best oxides of iron, and is frequent in the United States and in Sweden. The position of coal beds is usually determined by the dip of the stratum at its outcrop. These beds are often divided by intervening strata of limestone or shale. Augers similar to those used in boring artesian wells are employed to find the depth and thickness of these beds. This mode is extensively practiced in France. It is only within a little more than a century that coal has attained a commercial value, and within that period the scientific college of France sanctioned its use, declaring it not to be a poisonous fuel. Its consumption has now reached such a degree, that in a single year over a hundred and seventy millions of tuns were quarried, and of this quantity England produced one hundred millions of tuns.

By far the greater number of minerals used in the arts are found in the second form, viz.: that of veins, which are as definitely placed as beds. Where an eruptive rock has been forced upwards, breaking a series of strata, a vein is formed in the fracture, and also smaller veins are formed in the surrounding cracks. Accidents and faults occur in veins as in strata, and are caused by disturbances after the deposition of the metallic veins. These accidents are so various, and the veins so intricate, that science is sometimes at fault. This places geologists in bad repute among practical miners, and this feeling was so strong at the time of Prof. Silliman's visit to California, that he was refused admittance to many of the mines. Veins are often heterogeneous in their composition, and a section of a certain Spanish vein exhibited the following substances in the order of their enumeration: Partially decayed rock, or gossan; a brown iron ore; galena, or sulphide of lead; gray sulphate of lead; white sulphate of lead; pure white metal; iron with patches of ocher; barytes with patches of galena; galena in large grains; sulphate of lead; and lastly, the surrounding gossan. This is an extreme example, but veins are seldom simple.

A conformation not infrequent is that of a large vein termed *Vena Madre*, or mother vein, accompanied by smaller contiguous and parallel veins. This may extend for a hundred miles with a veritable width of from six to one hundred feet. Of this character are the celebrated Washoe and Comstock lodes, which latter produced from 1862 to 1865 inclusive, metal equal in value to forty-eight millions of dollars, two-thirds being silver and one-third gold. Lodes are sometimes of such definite width, that miners may and do divide them by the length, each owning a certain number of feet. Thus a vein is worked at several points. The surrounding medium is often quartz, in the fissures of which are found scales of gold. Silver is found in several forms, some of the most noticeable of which are ruby silver, horn silver, and hair silver, the latter being a most beautiful and delicate mesh or net-work much prized for collections.

The extreme hardness of the quartz, and difficulty of separating the metal, often makes the working of a mine impracticable. But here nature comes to our aid. By the action of water during long ages, the enveloping rock is decayed, and the golden scales and nuggets washed down, and deposited, together with a large amount of foreign matter, in the beds of the streams. These streams have been, by volcanic or other action, covered to some depth, with soil. The uncovering of these ancient river-beds, and the washing of the deposits there found, constitute placer mining. This method was first discovered in California by a Mormon, a member of Captain Suter's band, who in digging a race-way for a mill found many small yellow particles, which he supposed were gold. Of these he collected a large quantity, and in the autumn of 1848 sent them to San Francisco, then but a village. They attracted the attention of an old Georgian miner, who declared them similar to the nuggets found in the washings of that State. The news spread, and diggings for the valuable deposit were commenced in all parts of the State. In the spring of 1849 the panic extended to the Atlantic coast, and the memorable gold fever set in. During six months of that year no less than ninety thousand people went to California. As they exhausted the stream-beds found in the valleys, they followed the deposit up the mountain. This gave rise to that system of mining peculiar to America, called hydraulic mining. Rapid streams of water are conducted by elevated troughs, resembling old Roman aqueducts, and with immense pressure thrown against the sides of the mountains, washing down the soil, and uncovering these ancient beds. The matter thus washed down is made to pass over ditches constructed so as to catch the particles and nuggets of gold.

Platinum occurs in little flat grains, in appearance resembling dull silver. From this resemblance it derives its name *platina*, meaning little silver. This metal is unaffected by acids, and will not melt under a temperature of 2000 degrees. It is chiefly found in the Ural mountains, and is used in Russia as coin.

Copper is found like silver in veins, often mixed with silica and other impurities. It is very difficult to smelt, and this branch of industry is mainly carried on at Swansea in South Wales. There is also a smelting furnace at Boston. Carbonate of copper gives us two valuable compounds, viz.: blue carbonate, and green carbonate of copper, or malachite. Malachite is largely found in the Ural mountains, and is in common use in Russia. This metal is found pure, in sheets or nuggets, one having been found weighing five hundred tuns. It was so ductile that it was found impossible to blast it, and it had to be cut into sections with cold chisels.

Galena or common lead is found crystallized into cubes and in veins, running through limestone reefs. Owing to the irregularities of the original coral reefs, large cavities or chambers are found in limestone often filled with lead.

Tin is chiefly found in Cornwall in the form of tin stone. It is also obtained by washing, sometimes transparent and sometimes of a gray color, and is called stream tin. Mercury was formerly obtained only at the mine of Almaden in Spain; but soon after the demand arose for it in California, it was found south of San Francisco, and the mine was named New Almaden. These mines are of immense value and extent, but are in the hands of a gigantic monopoly, which will only produce a limited quantity. This cinnabar was used by the Indians for war-paint, and is sometimes found deposited in pouches like lead. Manganese is of a purple color, and to its presence the amethyst owes its beautiful hue.

Metals are sometimes found in solution in the sea, and certain seaweeds possess the power of secreting silver. Old copper sheathings also collect by galvanic action an appreciable amount of silver.

The lecturer briefly called the attention of the audience to the providential distribution of the various natural deposits. Coal, wood, and limestone are necessary to the successful working of iron mines, and in all countries where iron abounds, these materials are also at hand. When mining had reached such a stage that works were abandoned from inability to keep the mines clear from the water which collected, the steam-engine was invented and first used only for this purpose. The necessity for an increased amount of appropriate fuel then arose, and was supplied by the discovery and use of coal. Thus science supplies the needs and emergencies of the arts.

CEMENT FOR FASTENING INSTRUMENTS IN HANDLES.—A material for fastening knives or forks into their handles, when they have become loosened by use, is a much-needed article. The best cement for this purpose consists of 1 lb. of colophony (purchasable at the druggists'), and 8 oz. of sulphur, which are to be melted together and either kept in bars or reduced to powder. One part of the powder is to be mixed with half a part of iron filings, fine sand, or brickdust, and the cavity of the handle is then to be filed with this mixure. The stem of the knife or fork is then to be heated and inserted into the cavity; and when cold it will be found fixed in its place with great tenacity.