ELIZABETHAN FIREPLACE.

The accompanying engraving represents an Elizabethan fireplace from the factory of Messrs. Barnard, Bishop & Barnard, of Norwich, England. This admirable specimen of ironwork was a part of the furniture of the Elizabethan house placed at the disposal of the Prince of Wales at the Paris Exhibition.

The American Potteries.

A *World* reporter has gathered some interesting facts regarding the growth of the pottery industry in this country during the last twenty-five years, and the present condition of that industry, from which we extract:

At the last convention of pottery manufacturers, held in Trenton a few weeks ago, forty firms were represented, including manufacturers of yellow and Rockingham wares, of cream colored china, of white granite ware, and of pure china and decorated goods. Pottery, as a distinct and important industry, was not known in this country twenty-five years ago. There were potteries then, but they turned out only the most common articles and of a poor quality. At that time the tariff on imported pottery, exclusive of the best china and decorated ware, was 20 per cent, and so it remained until 1861, when it was raised to 25 per cent. The protection thus afforded, although small, gave an impetus to the trade, and better wares were immediately put upon the market. When the tariff was finally raised to 40 per cent the industry leaped up, and at present there are enough potteries in operation to produce twice the quantity of wares imported from Europe and Asia. The result, the potters claim, has been, in a general way, to reduce the price of wares, so that jobbers can sell them 18 per cent cheaper than they could in 1860, and to improve the quality of the goods themselves.

A minor hinderance to the progress of the industry has been the high price of clay, flint, and spar, the materials most largely used in manufacture. The difficulty in this respect is not yet altogether obviated, for the best imported qualities may be obtained at less cost in this city than the best qualities from Missouri. Such a condition of affairs will soon end, however, if the project of the convention—to co-operate with the owners of the best mines and clay beds to the extent of encouraging them to wash the ball clay—should be carried out with success. The manufacture of yellow and Rockingham wares, which is conducted chiefly in the West, was the first step toward introducing home products into the market. These wares are of the cheapest and most common order. Cream colored ware, which is manufactured chiefly at East Liverpool, Ohio, Jersey City, and Trenton, is next in the order of superiority. It includes common table ware and household crockery. Next in the order of manufacture comes "white granite," sometimes known as "American china." It is the best porous bodied ware, and is superior to cream colored ware chiefly because it has a vitreous glaze. It also is manufactured in Trenton, where there are sixteen potteries, and in other places in a smaller way. The manufacture of china is confined almost exclusively to Greenpoint, where it was first tried as an experiment in 1863, although no goods were put upon the market for two years afterward. The superiority of china to other wares for household use is due to its homogeneity in body and glaze, neither of which is porous. Experiments in designing and decoration were from the first quite expensive, and had it not been for the high prices which prevailed for all sorts of ware during and soon after the war, the manufacturers would have abandoned them. Their aim has been to supersede not only imported ware, but foreign designs, and to give to the decorated goods that leave the factory a distinctive American character. The Century Vase, for instance, which was exhibited at the Centennial, has a central figure in relief of Washington, medallion style, embellished at the corners with small pictures representing the chief industries of the country. Tea and dinner sets are decorated with native leaves or ferns, or in a style pronounced and original.

MALLEABLE BRASS.—A German periodical is responsible for the following method of making malleable brass: Thirty-three parts of copper and twenty-five of zinc are alloyed, the copper being first put into the crucible, which is loosely covered. As soon as the copper is melted, zinc, purified by sulphur, is added. The alloy is then cast into moulding sand in the shape of bars, which, when still hot, will be found to be malleable and capable of being brought into any shape without showing cracks.

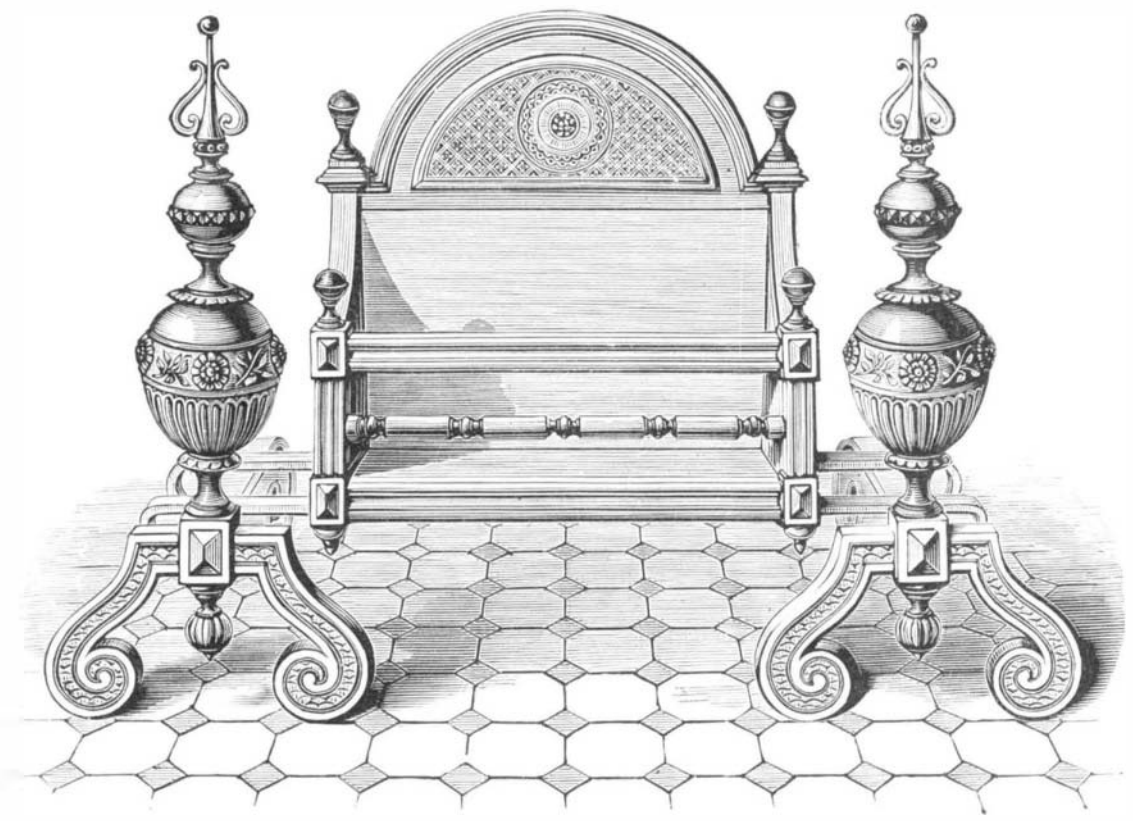
Weatherproof Houses.

The conditions essential to what may be called comfortable house building—just now forced upon us by the weather—seem, if not misunderstood, to be willfully misapplied by some architects and builders. The gospel of true economy has been preached to them with unremitting zeal, but as far as house construction is concerned, with little or no good result. We constantly see houses built with the intention, apparently, of wasting heat and space, and these two fundamentals are considered to be provided for if the grates are not made too deep or large, and the front passages or halls are squeezed to the narrowest proportions. The most commodious of all forms in which a house can be built is a square. Now it must be noticed the builder adopts this shape of house because it saves the expense of outside walling and expensive roofing, and the architect abhors it because it is inartistic. The consequence of which is that the square or bungalow form of dwelling, even in the suburbs of towns, where it is most appropriate, has grown unpopular of late years, more especially since Gothic has been the prevailing style. It is satisfactory to find a return to it, though economy has less to do with the matter than fashion. Now, we believe economical house building near all large towns must ultimately adopt the square or rectangle. But there is something more in the square plan than a saving of walling and roofs. It is the only form that economizes the warmth of a house, as the larger proportion of the wall surfaces are internal. In the irregular and picturesque style the outer walling is so much more cold surface added to the work the fires have to perform; and we may say the waste of heat in the fashionable villa residences is quite 30 per cent more than in houses built in the row. The "picturesque loving" architect—and who is there that does not admire the accidental grouping and succession of breaks and gables in an old manor house of the later Tudor or the Stuart period?—increases his external walling by every projection and recession he makes; in fact, one of the articles of his creed is to pronounce his separate rooms, which cannot be done except by adding to their outer exposed surfaces. All these charms of piquancy and outline are unfortunately bought at the cost of fuel and comfort, and we may appeal to every candid and outspoken member of the profession in whom the man of science is not irretrievably lost in the enthusiast for style, whether a house of the square form is not more comfortable than the irregular and gabled villa or chateau? But the principle is self-evident that in a plan of square form the outside walls are minimized, and the internal warmth of a central stove-heated hall or the internal fireplaces equably diffused throughout every part of the building. The advantage of well built hollow walls, and the importance of damp-proof courses, we need not in a professional journal insist upon. In considering walls, however, the question of a facing occurs; and the profession generally have set their faces against cement as an external covering.

We are not inclined to enter again into a controversy that has been waged so often—a correspondent the other day in our journal discussed the subject from a practical point of view—but we think that there has been a great amount of absurd prejudice entertained by architects of the muscular Gothic school against the use of Portland cement. The fact is the material was so abused by a former generation—it covered up such vices of construction—that a well founded contempt for stucco sprang up. But why should a valuable material suffer because of its ignorant employment? For Portland cement is a most valuable ally to the architect when employed rationally, and for the outer surfaces of rough brick or concrete walls it is often absolutely necessary. The great evil of its use, we have always contended, is its being made to represent such features as stone cornices, trusses, and other details for which stone or bricks can be only rightly used; but if used for the plain surfaces of walls it admits of many forms of appropriate decoration.

The next important feature in a weather-proof house is the roof. Here, again, the advantages of a plan in which the external boundaries partake of a square are obvious to every practical builder, but for like reasons to those at which we have hinted in regard to irregular houses, the fact is disregarded by the "artistic architect." A square trough shaped roof is both unpleasing and easily choked up, and a lofty pyramidal roof is quite as ungainly and ugly. But both these evils can be obviated by making one or two slight breaks, by which a rectangular arrangement of two or more span roofs may be gained, always remembering that the simpler the roof is, and the fewer its component parts, and therefore gutters, valleys and hips, the better. It is somewhat amusing to find this rule disobeyed, all conceivable jumbles of steep roofs, flats, and gables being adopted to produce piquant bits of effect by the young architect, though it is by no means a laughing matter with tenants who have to do external repairs. The bad arrangement of roofs with respect to aspect is one of the commonest defects. It is not unfrequently that one sees a house with the valleys opening toward the most exposed quarter, or a series of open gutters in such a position that every wind would convert them into eddying troughs. Hopper-shaped roofs and inclosed gutters are arrangements always better avoided, and the principle should be to expose as little roof surface to the wind and wet as possible. The conformation of a roof we believe to be of immense importance to the comfort and security of a house, and no part thereof should be open to the attacks of heavy rainfalls or severe gales. For duchess or countess slates a lap of 3 inches is not too much for ordinary pitches, and 2 inches is much too small; each slate should be secured with two nails, and these ought always to be of copper, zinc, galvanized iron, or dipped in oil. Again, lead should be of at least from 6 lbs. to 7 lbs., the latter in the flat gutters and the former in the hips and valleys. Patent ridge and hip rolls, made of slate, fastened with screws set in oil putty, are next to lead in effectiveness, and it should ever be remembered that cheap roofs are the dearest in the end.

There is also an immense amount of ignorance about chimney building, or as to what constitutes a good drawing and what a bad drawing chimney. We know it is perfectly useless to frame a code of rules on chimney building, when the exigencies of house design have to be consulted, but when nothing interferes all chimneys should be placed on the sheltered sides, as internal stacks undoubtedly draw the best. Chimney stacks should always be built high enough to clear the effects of obstructing roofs, as a "blow down" is often experienced in flues that barely overtop an adjacent roof, and in those in a valley between two roofs. Of course, the inducing currents must be considered in reference to the prevailing winds, and not from the lee sides. One common error is to make flues too capacious, and to build them with large throats, the consequence of which is the upward currents or gases are cooled down and the velocity retarded. The heated gases ascend in the center of the flue, which, if too large, cause down currents to be established, and the phenomena of smoky chimneys are greatly due to this cause. We might extend these remarks to the best position for fireplaces, upon which much might be said; but, as we have just remarked, the exigencies of plan are paramount, and the builder or architect has to consider rather the least objectionable of modes than the adoption of the best course.—*Building News.*



ELIZABETHAN FIREPLACE IN THE PRINCE OF WALES' PAVILION, PARIS EXHIBITION.

Staining Floors.

THE London *Furniture Gazette* commends the following method of staining floors in oak or walnut colors: Put 1 oz. Vandyke brown in oil, 3 ozs. pearlash, and 2 drms. dragon's blood, into an earthenware pan or large pitcher; pour on the mixture 1 quart of boiling water; stir with a piece of wood. The stain may be used hot or cold. The boards should be smoothed with a plane and glass-papered; fill up the cracks with plaster of Paris; take a stiff brush, dip in the stain, and rub this in well; the brush should not be rubbed across the boards, but lengthwise. Only a small piece should be done at a time. By rubbing in one place more than another an appearance of oak or walnut is more apparent; when quite dry the boards should be sized with glue size, made by boiling glue in water, and brushing it in the boards hot. When this is dry the boards should be papered smooth and

varnished with brown hard varnish or oak varnish; the brown hard varnish will wear better and dry quicker; it should be thinned with a little French polish, and laid on the boards with a smooth brush.

THE LURAY CAVERN.

BY H. C. HOVEY.

(*Continued from page 37.*)

At the southern end of the area known as the Elfin Ramble begins Stonewall Avenue, not yet thoroughly explored, but seeming to lead toward Ruffner's Cave. Its chief attractions are Brand's Cascade, unsullied alabaster, and the most beautiful formation of its kind in this locality; the Twin Lakes, united by a tunnel; a curiously carved and inlaid floor; a bank with a profusion of mottled drapery; and also various grotesque similitudes.

On returning we cross a natural bridge to the Imperial Spring, 16 feet deep, in a grotto 35 feet long and 25 wide. Brown columns form the wall, with white stalagmitic statuettes set in niches, and between them snowy alabaster gushes out and over the rocks below. The roof slants from front to rear, and is set as thickly as possible with stalactites about a foot long, and averaging by count 64 to the square foot. Calculating on this basis, there are within this little grot 44,800 pendants, each tip glistening with a pearly drop. What millions there must be in the whole cavern!

One of its distinguishing features is the existence of these pools. There are hundreds of them. None of true springs, and none are large enough to be called lakes, though both terms are used. The basins vary in size, from 6 inches to 50 feet in diameter. They are often found in strange places; on a ledge, on top of a mound, or on an overgrown stalagmite. The water is so absolutely transparent that the incautious explorer may learn of its presence only by walking directly into it; and more than one has tried to drink from a bowl that had run dry. This purity is due to percolation through the rocks.

The refined carbonates in solution are slowly deposited. Where continuous trickling into a shallow pool has kept the water in a state of agitation, spherical bodies have been formed. These concretions are called pearls, marbles, birds' eggs, and snowballs, according to their size; there is a very large one called the "cannon ball." The exterior of the nodules is often highly polished by friction, and the interior, on fracture, exhibits a shining, radiated structure. They become attached to the bottom whenever aqueous agitation ceases; and, if the drip meanwhile continues, they often grow up into a cone. This explains the fact that stalagmites frequently rise out of pools. The same result, however, would ensue if a bit of limestone or any other hard substance should fall into the water.

It was some time before we realized the fact that all these calcareous basins were built up by deposits from the water they contained. The beautiful crystals, drusy, feathery, fern-like, lining the sides and bottom of every water-filled cavity, are not mere ornaments. They are the materials of which the walls are made. Under the microscope grains from the substance of the wall are identical with the lining crystals, in shape as well as composition. Many of the well known varieties of calcite are found; and in some of the long crystals a prismatic development led us to class them as aragonite.

The more rapid evaporation at the surface so aids the work of crystallization as to make the edges grow over the water and give the exterior of the basin a remarkable curve, of which a beautiful illustration is given in the structure of the Coral Cascade, near the farther end of the cave. Ten little terraces, with ruffled margins, rise in succession, each catching the overflow of the one next above, and the upper one is over three feet deep, with the front greatly curved. The appearance of the crystals is not unlike the grouping of corals.

The variations of water level are strongly marked by rings or ridges, especially in some of the larger pools. Brodus Lake, for instance, not only reposes on a bed of crystals, overarched by a vault bristling with stalactites, but it is girdled by a crystalline strand once covered by its bright water. It is now 50 feet across, but was formerly twice as wide and 5 feet deeper, judging from the curved rampart, whose margin it must have touched, and whose horizontal folds clearly indicate the changes of level. To the same cause are due the outgrowths about the roots of some rich buff stalagmites slashed with white, and others less conspicuous. These are flat on top and rounded underneath like varieties of woody fungus. They vary in size from one to 8 inches, and some of them have a velvety coat of olive-tinted crystals and are tipped with red and purple.

When the excess of carbonic acid, by which the carbonate of lime is held in solution, evaporates rapidly, besides the crystal crust below, a sheet, like a film of ice, is also shot across the surface. A fine example of this is found at the Fairy Spring, whose brim nearly meets the stout stalactites that hang above it; and whose surface, 12 feet broad, only shows half its extent, the rest being concealed by such an icy film as that described.

We nowhere found the acicular crystals of sulphate of magnesia, nor the gypsum rosettes, for which the caves of Kentucky and Indiana are so celebrated.

But we are lingering too long amid the sparkling pools and their calcite gems. We cross Pluto's Chasm, near its southern end, where a curious palisade of stalagmites grows to bulky dimensions on the further margin. By the bridge stands Proserpine's Pillar, one half brown and the other white. Down the dark gorge a specter seems to wave its arms. It is only another snowy column.

On the left a sloping ascent of red clay, deeply furrowed, shows that we are not far from the surface. As a visitor was writing up his notes, near this point, a rabbit sprang by, upsetting his lamp, and disappeared up the slope. A pit of considerable size, not faraway, together with our subsequent survey of the surface, indicates that the locality is directly under the great sink northwest of the entrance.

After admiring the charming formations of Oberon's Grot, and especially the Crown and Fairy Veil, an elegant bit of transparent drapery, we pass beyond a stalagmitic curtain, only 6 inches thick at the edge, but 30 feet wide and 50 high, and find ourselves in the Giants' Hall, of whose concourse of wonders no clear idea can be had without repeated visits.

Seated on this Fallen Column, that looks like a prostrate and moss-grown oak in the forest, let us study cave history.

The popular notion that volcanic upheavals caused these subterranean cañons is correct probably only as to the original rift in the rocks; all else was done by the chemical and mechanical action of acidulated water. This subtle agent sought out the joints, seams, and other lines of weakness, till the water-swept channels deepened into what is now Pluto's Chasm. Softened ledges were dislodged, successive floors undermined and cut through, walls between this and other chasms broken down, until cavities were finally scooped out far more prodigious than those now visible; and the axis of erosion was S. W. to N. E. Branches at different levels were also excavated.

Room was made by this means for calcareous deposits, and the vast halls began to be slowly filled up by stalactites and stalagmites, many of them growing to great size.

Then came a catastrophe. The outlet of the subterranean river was somehow obstructed, and the pent up waters were accumulated till the entire cavern was filled from lowest pit to loftiest gallery—a fact proved by the earthy deposits and the uniform erosion of dripstone. (Dripstone is a term authorized by English geologists, representing all kinds of cave formations.) During this period, whose duration we have no means of conjecturing, the carbonic acid absorbed by the rain water from the atmosphere, and more especially from decomposing vegetation and surface soil, would be brought into contact with the calcareous deposits, destroying their texture and causing a species of decay. Under the blackened exterior of this Fallen Column is what once was alabaster firm as ivory, but now it is transformed into a chalky substance, through which a knife blade can be thrust to the hilt.

Finally a new outlet was found, independent of the original system of drainage, and supposed to be in the deep spring near Blackford's Furnace. There is every indication that the waters departed with violence, tearing down loosened rocks, hurling stalactites to the ground, and felling huge columns like trees in the tornado's path.

On an eminence to our right stands a sublime monument of aqueous energy. It is the Hollow Column, 100 feet in circumference and 40 feet high. Finding it too rugged and compact to be overturned, the fierce waters pierced its marrow, leaving a tubular passage from top to bottom that is at present the only way of access to the extensive and beautiful galleries above the Giants' Hall, the distance from whose ceiling to the floor below is said to be in certain places about 160 feet.

In Stebbins Avenue, near the entrance, besides the Silver Lake and other attractions, is the Leaning Tower, a mass of stalagmite, whose enormous weight broke down the ledge of limestone, 3 feet thick, on which it had been created. The waters undermined it, and it fell about 6 feet into the depression, where it now stands amid a broad pool; it was not overturned, only tilted like the Campanile of Pisa.

The flow of subsiding waters became gentler toward the last, merely removing the softened exterior of the dripstone, leaving a wavy surface with sharp angles and polished sinuosities, often exhibiting diversified layers like the gnarled grain of precious woods.

The volumes flooding the cavern from the funnel-shaped sink overhead brought in, first and last, a quantity of clay and soil equal to the dimensions of the sink, plus the washings from the upper hillside. The sink is now about 800 feet across and 40 feet deep, and may have been larger before the general surface was lowered. Hence the sum total of alluvial filling is many thousand cubic yards. This cause, together with the decomposition of dripstone, accounts for the embankments in the Elfin Ramble, whereby that portion narrowly escaped obliteration.

Quiet having been restored, and the water trickling instead of rushing, a totally new set of stalactites came into existence. Some of them were formed, as usual, from the crude materials furnished by limestone; but others from the refined substance already once used in the older formations.

Thus originated very striking contrasts. How grandly the Angel's Wing, with snowy plumage, sweeps out from the dingy and corroded mass whose inner substance it only recasts! Those softly-draped and tinted figures in the Saracen's Tent really owe their being to the grim ogers that guard them. The finest of them all, 8 feet high, and lovely as a Houri, has its rippled and dimpled contour, because the pellucid alabaster so faithfully followed the wrinkles, while it rounded the angles of the ancient and worn form that it incases.

Before leaving the Fallen Column let us take its measure and ask its age. It is exactly 12 feet in diameter and 21 feet long as it lies, with its butt lower than its tip, shortened at least 15 feet by the fall. By burning magnesium we discern far above us the scar made when it was wrenched away and fell swaying to and fro. Time enough has elapsed for a cluster of stalactites to form hanging transversely from the end now uppermost. They are 11 inches wide and 4 feet and 5 inches long. According to long-continued observation of the rate of stalactitic growth in Wyandot Cave the age of this group would be exactly 1,325 years. But the only way to tell the age of Luray Cavern is by a series of local experiments; and even then only an approximation can be made.

Music may be had in these subterranean halls. Mellow tones, like tolling bells, follow blows on the Chimes. Another large group of musical stalactites is well named the Organ. It fell, with the ledge on which it grew, points downward, into the mud, leaving many of its 56 pipes free and sonorous. They are solid, not tubular, and vibrations of the larger ones last a full minute. The entire musical scale can be produced by striking selected stalactites, and simple airs may be played by a skillful hand.

Space is desired for more than the mere mention of Babel, with its 22 stories rising on dwarf colonnades; the Mosque, with its domes and minarets; the Bridal Chamber and its alabaster floor; the Turbaned Sultana; the Empress Column, white, with a pink capital; and many a stately but nameless shaft. A secret way leads back from the Spectral Column to the Empress, and on to the Pavilion.

The Swords of the Titans are monstrous blades, 40 feet long, suspended from aloft, and keen of edge. Their hollow structure can be seen where was once broken off a section that has now disappeared. Their origin, and also that of the delicate scarfs already described, is in trickling lime-streams, running together on a sloping surface and then growing downward till the curved sides meet in one edge. Acids have made some specimens in the cave look like sides of leather or even like threadbare blankets and flimsy old shawls.

The Double Column is surrounded by the Naiads' Bath, and is as unique as it is grand. A stalactite, 50 feet long, tapers to the floor with unbroken longitudinal grooves. Its companion stalagmite, instead of meeting it point to point, rises in joints and stories 30 feet and holds it in an embrace.

The Pavilion is approached through a corridor walled in by huge fallen rocks. It is circular, with many alcoves; is 100 feet wide, and is floored for the use of assemblies.

The Chalcedony Cascade, at the entrance of this room, is a mass of mammillary alabaster, 25 feet high and 30 wide, a continuation of a similar formation above, that can only be seen by difficult climbing. It is semicircular and remarkable for its variegated hues: brown, yellow, steel-gray, ashes-of-roses, drab, milk-white, and blue. It is a new formation upon the old, and a row of stalactitic teeth 4 feet long, ancient relics, skirts the base.

By a perilous ascent over stubby stalagmites we gained admittance to Campbell's Hall, and a noble room to its right. In the former stands the Mermaid, 5 feet high, tapering from 2 feet at the base to 1 at the flat white top. Strings of shining beads adorn the sides downward, growing into scales like those of a pine cone, only pearly instead of brown, and with pink edges. Increasing still in size they turn to a lead-blue. Dispersed about the base are little white stalagmites seeming to float on milk. Brown mossy crystals grow in clusters near by this marvel of beauty.

Beyond the Pavilion is the Coral Cascade, and still further on an exquisite grotto named in honor of Mr. J. J. Collins, whose graphic word-painting and ingenious theories have interested so many thousands in the scenes of Luray Cavern.

The distance from the entrance directly to Collins' Grotto does not exceed 1,500 yards, and might be shortened. But the tunnels, catacombs, and galleries expand into a labyrinth, for exploring whose intricacies many days are required. The task will be much abridged when the proprietors carry out their plans for making every portion easily accessible.

(*To be Continued.*)

New Agricultural Inventions.

Messrs. R. S. Squires and Frank Kaiser, of Kansas City, Mo., have patented an improved Baling Press for baling hay, straw, cotton, for pressing pomace, grapes, etc., in cider and wine making, and for other similar uses. It is simple, convenient, and effective.

Messrs. John J. Reicherts and David Tipton, of Delaware, Ohio, have patented an improved Field Roller and Planter, by which the seed is dropped by simple mechanism, and then covered by the roller, the ground at the same time being crushed and broken and left in good condition for after operations.

Mr. Robert L. Patterson, of Belle Plaine, Kan., has patented an improved Attachment for Corn Planters, which is so constructed that the dropping slide is operated by the advance of the machine to drop the seed at uniform distances apart.

Mr. Horace W. Thompson, of Bellows Falls, Vt., has patented an improved Scythe Snath Fastening, in which the ferrule attached to the end of a snath has a projecting head or plate, in whose outer end is formed an arc-shaped slot to receive and permit lateral adjustment of the loop or eyebolt which clamps the shank of the scythe.

Mr. Henry Hardick, of Liberty, N. Y., has patented an improved Fence. The invention consists in a metallic post having an anchoring crossbar or foot cast upon its lower end, and buttons upon one of its vertical sides, for the attachment of the wire rails; an intermediate stay post is also provided which anchors a vertical cross tie connecting the longitudinal wire rails.