

in their several districts, and the replies are said to have almost unanimously indicated as the leading elements or influences great sobriety, regular labor and usually in the open air, daily exercise short of fatigue, early hours, a comparatively well-to-do life, calmness of mind in meeting troubles, moderate intellectual powers, and a family life. The beneficial influence of marriage on the duration of life is universally admitted, and remarriage does not seem to be unfavorable. The prefects also indicate heredity as a frequent cause, and the influence of climate is likewise admitted; this latter, however, is separable with difficulty from other causes which may be operating simultaneously; but if all things were otherwise equal, it would seem that southern are less favorable to longevity than northern climates.

#### IMPROVEMENT IN MACHINE GUNS.

In machine guns the heating of the barrels has limited the number of charges that could be rapidly fired before they become too hot for use, so that after a period of rapid firing the gun would become dangerous if not allowed to cool. The engraving shows a device for keeping the barrels cool by surrounding them with water under atmospheric pressure, thus preventing the temperature from rising above the boiling point of water. A temperature not exceeding 212° Fah. does not impair the action of the gun.

The barrels are inclosed in a metallic water-tight casing having a vent for the escape of steam. The casing is filled from time to time during firing, as may be required. The mechanism for rapidly loading and firing is omitted in the engraving. This invention was recently patented by Mr. E. G. Parkhurst, of Hartford, Conn.

#### HOWE'S CAVE.

BY H. C. HOWE.

The most massive and prominent rocks in Schoharie County, N. Y., are, first, the Water limestones, then the Pentamerus limestone, and above that the Delthyris shale. These all belong to the Helderberg division of the Silurian system. From the Water limestones immense quantities of cement are made. The rock lies in rather thin strata, and is easily acted on by the elements. The Pentamerus limestone is firm and compact, and abounds in fossils. The Delthyris shale is really granular gray or blue limestone, rich in coralline remains. These formations are so related to each other as to favor the excavation of deep valleys, flanked by cliffs and mural escarpments, the hills rising by successive terraces to mountainous proportions.

Several caves had already been found in this region, the largest of them being the one known as Ball's Cave, when in May, 1842, Mr. Lester Howe resolved to open what had previously been called the Otsgarage Cavern, but which now bears his own name. A stream of considerable size had long been observed flowing from it by several outlets. This subterranean river was the agent that had made the cavern; but it had afterward obstructed it by *débris*.

Mr. Howe hit on an ingenious plan for utilizing the water. He first loosened the clay, gravel, and broken rocks; then stopping other outlets he flooded the main channel, and thus forced the stream to sweep out its own deposits. This having been effectually done, he reopened the side passages, and made a dry path for 350 yards to Cataract Hall, where the waste water is now chiefly drained away through a transverse crevice. Another drain is at the Whirlpool, 100 yards beyond. These seem formidable terms to be applied to localities not in any way frightful to those visiting the cave in summer; but the guide assured me that during a rainy season the names were appropriate, and that there were times when the whole cavern would be filled, and, as he said, "pour forth a mighty flood."

The pathway beyond the drains crosses and recrosses the rapid, musical stream by stepping stones, until at a point about 1,350 paces from the entrance a double dam has been built, forming a pretty reservoir of extremely pure and lim-

allowed to be eaten through by rust. We would, however, recommend the substitution of electric lights.

It is due to Hon. J. H. Ramsey, the present owner of the cave, and Mr. J. M. Russell, the lessee of the premises, to say that every consideration is shown for the safety and comfort of guests, and that especial facilities were granted to us as explorers.

Our guide, Van Dyke, pointed out noteworthy objects, having an incident or legend to tell associated with each. Several romantic people have been married in a room 150 yards within the cave, called for that reason the "Bridal Chamber." It is reached by a long flight of steps, and ends in two or three interesting domes about 40 feet high. The temperature, which was 63° Fah. at the entrance, had here fallen to 50°, and that was found by repeated experiments to be the mean temperature of the cave. The mercury rose in certain places to 52°, and in others fell to 48°, the variation being probably attributable to atmospheric currents. The average is about 6° colder than the temperature of Mammoth Cave, nearly corresponding in each case with the mean temperature of the earth.

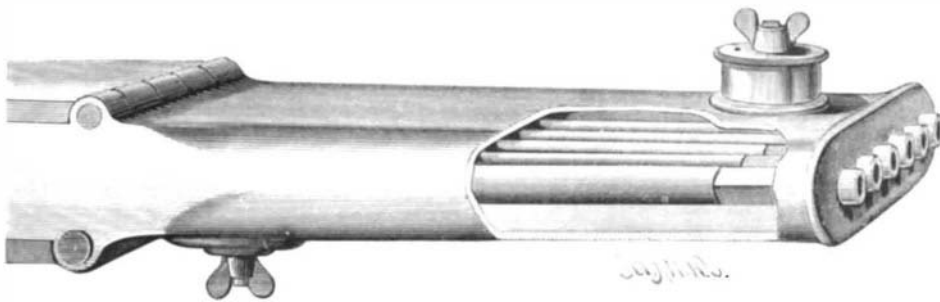
The currents of air vary considerably in intensity and direction, owing in a measure to the proximity of outlets and the windings of the cave stream. The air is chilly, and I missed the charming sense of exhilaration noted by every visitor to Mammoth and Wyandot caves, and rightly attributed to the natural oxygenation produced by chemical changes.

An incredible story is told of a young man from Georgia who was cured of pulmonary disease by dwelling three months in a dreary place called the

Consumptive's Chamber. Beyond this is a large hall called the Giant's Chapel. Howe's Pillar is a mass of yellow alabaster, 12 feet high, reached by a side passage from Cataract Hall. From a point 1,000 paces within, a stalagmite was removed in 1874 and set up as an ornament in front of the hotel. This fact I have from the guide. Applying my pocket-rule to the new stalagmite that has grown up in its place within six years, it was found to measure 13 inches in thickness and 4½ inches in height. This is a remarkably rapid growth, compared with rates observed in other caverns, and will possibly constrain us to modify our estimates of their antiquity.

In the Haunted Room the imagination may decry spectral forms. But more interesting is the strong draught indicating the nearness of some large apartment, into which an entrance has not yet been effected. The echo in Music Hall prolongs aerial vibrations for only about five seconds. The resonance of the floor, as we tread upon it, again suggests a hollow place underneath. It is asserted in a pamphlet, published fifteen years ago, that there are fractures opening "into a giant cavern below." None were pointed out to us; and if such are known it would be well to explore them, for the present cave floor is far above the natural drainage level.

The reservoir, to which we have already referred, is called the Stygian Lake, and is navigable by a small boat. It is

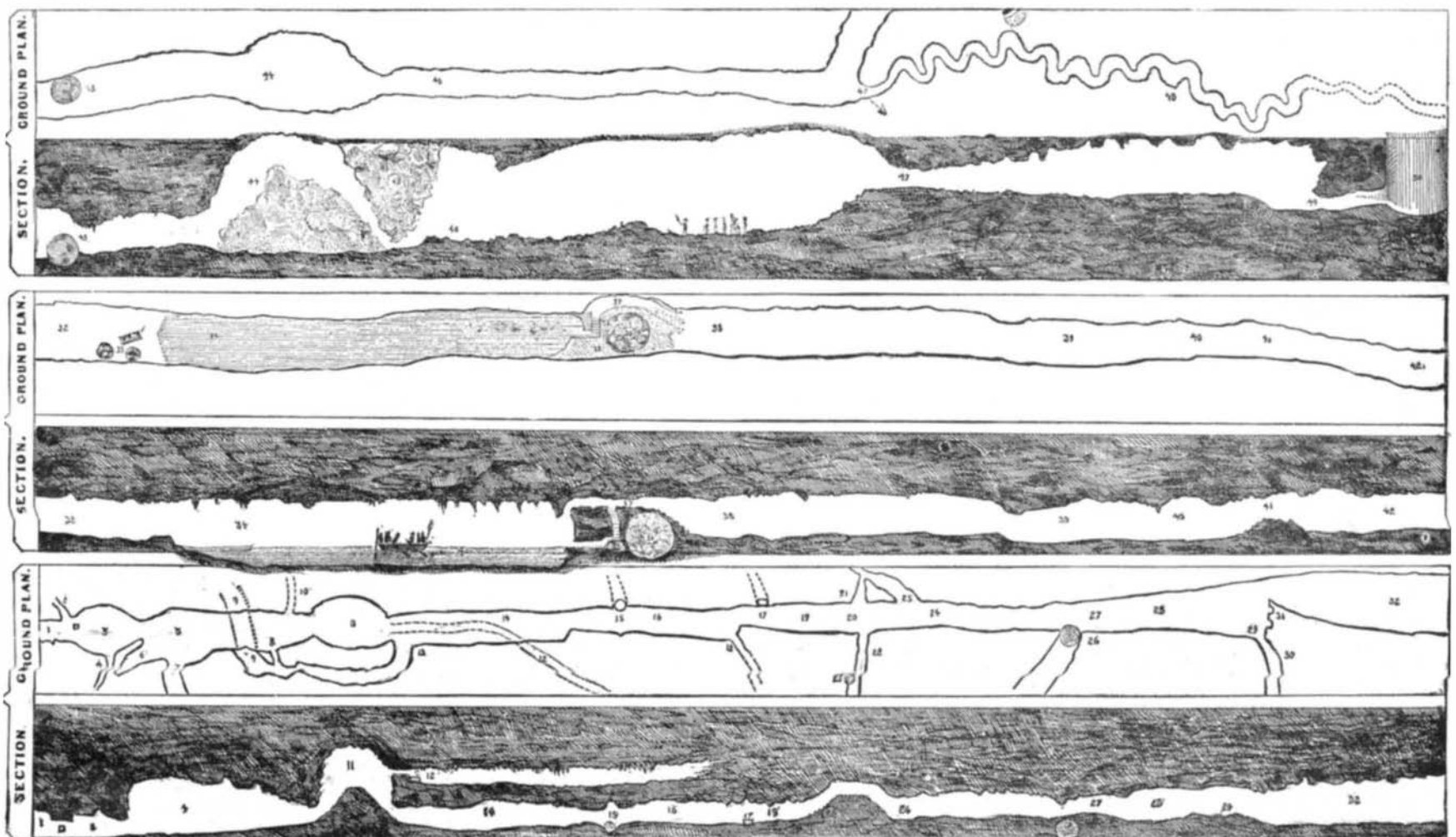


PARKHURST'S MACHINE GUN.

pid water. Iron pipes convey it out to supply numerous dwellings, a large mill, the hotel, and the tank at the railroad station. The supply has never been exhausted.

So much digging and blasting have been done between the entrance and the reservoir as to detract from the primitive wildness of the cave, and it too much resembles an unfinished railway tunnel. Gas, also, has been introduced, thus far with a pleasing effect ordinarily, though far less picturesque than torches and not free from danger. This appeared on the occasion of my first visit, which was in company with a party of 400 excursionists, many of whom caught hold of the pipes overhead to steady themselves along difficult paths. This procedure disturbed the flow of gas. A number of jets were extinguished; and although frequently relighted they could not be kept burning. The air grew heavy with escaping gas, which, being manufactured from gasoline, is very insidious, so that our first indication of peril was the fainting of several persons. I am satisfied that a fatal explosion was averted only by our resolutely shutting off the supply, thus leaving the party in darkness until torches arrived, by the light of which we withdrew to the purer and safer atmosphere above ground.

The next day we examined critically the whole system of lighting up the cave in company with Dr. Lewis, the chemist of the Boston Gas Works, our conclusion being that it is safe enough, if the pipes and jets are not tampered with nor



MAP AND PROFILE OF HOWE'S CAVE, NEW YORK.

about 16 feet deep when full, and is remarkably transparent. Among the numerous stalactites pendent from the roof, the guide singles out the Harp, which emits musical sounds on percussion. The lake is said to be a quarter of a mile long, though its width does not exceed 40 feet at any point. The sheet of water looks finely when illuminated with magnesium or by red fire.

Just beyond the landing place the passage is obstructed by a huge stalagmite reaching from floor to ceiling, and about 30 feet in diameter. Climbing around its upper portion by a narrow pass, we find ourselves on the edge of a pool that is apparently a continuation of the lake. It is surprisingly deep. We sounded to the depth of 35 feet without touching bottom, and took Van Dyke's word for its being 60 feet deep. As the surface of the water is only 45 feet above the level of the hotel, the bottom of this pool must be lower than the mouth of the cave; and the pit it fills may have been the former passageway of the stream to lower tiers of caverns underneath.

The cave now grows wider and with larger chambers as we follow the windings of the rivulet. Uncle Tom's Cabin stands 500 yards from the lake, and is a unique stalagmite of great dimensions, through whose base the flowing water has cut a tunnel by which one can gain the pathway beyond. Next is a hall about 200 feet long and 80 feet high, extending to a gigantic pile of rocky fragments, surmounted by several large stalagmites bearing fanciful names.

Descending from this eminence we find ourselves in a valley only about 10 feet wide, but of remarkable height. Masses of broken stalactites encumber the way, and 60 feet overhead is a projection, 25 feet square, called the Table Rock, accessible by hard climbing. The guide told us that this valley is 1,100 feet below the surface; a fact explained by saying that the cave pierced beneath a lofty hill, a spur of the mountains. We had no means at hand for either verifying or disputing this extraordinary statement; but we were led to doubt it because of the immense quantities of miry clay obstructing several branches that we attempted to explore.

The Winding Way trends to the right from the main cave line, and, together with what it leads to, is the most remarkable portion of the entire cavern. The ground plan of this underground cañon would resemble the peculiar articulation of the suture joining the bones of the skull. The Winding Way is from 2 to 4 feet in width, from 3 to 30 feet in height, and, as measured by us, about 550 feet in length. It is so crooked that it seems as if one changed his direction at every step. The walls are coated with translucent stalagmite equal in beauty to Mexican onyx, which it much resembles. I saw nothing finer in quality, even in Luray Cavern, where the display of Oriental alabaster is so exceedingly diversified and beautiful. The cañon is here and there curiously spanned by stalactitic arches. Having gone about two-thirds of the way through this bewildering passage, we come to a large cavity formed by the dislodgment of a triangular mass of rock which has wholly disappeared under the clay. The Winding Way ends in a circular aperture, through which one can barely crawl, by lying flat on the ground. This, of course, is called the Fat Man's Misery, a name without which the nomenclature of no cave would be complete.

Beyond this place of merry difficulties is the Rotunda, that ends the cave in this direction. There are many excavations in Mammoth Cave of the same nature as the Rotunda, the local name for them being "domes." Some of them are far larger, but none are more symmetrical. They are caused by the rotary action of whirling water freighted with sand and gravel, thus transformed into a powerful cutting engine. The diameter of the Rotunda is 25 feet, and its height was said by the guide to exceed 300 feet, in proof of which he alleged that rockets had been fired upward in it warranted not to explode until they had reached such an elevation. Moreover, it is said, and commonly believed, that no mortal ever saw the apex of the dome. It is a pity to break in upon such pleasant delusions, but regard for the truth compels me to say that by burning common red fire I saw the apex with distinctness; and comparing it with domes in Mammoth Cave, whose height is definitely known, I should say that the Rotunda does not greatly exceed 100 feet in height. But it is, without exaggeration, a very remarkable dome, and it pays the visitor for all the trouble taken in reaching it.

A degree of disappointment must be confessed as to the entire dimensions of Howe's Cave. Some enthusiastic letter writer once said that it was twelve miles long. The report on the geology of New York states that it has been "explored to a distance of seven miles, and seems to extend farther." A clerical friend assured me that it was at least six miles long. It is recorded that one avenue "has never been explored to its full extent, although a party once spent eighteen hours in it, traveling the whole time, and not reaching the end." Finding that the proprietors themselves discredited these statements, and had no objection to my measuring the cave, I accordingly undertook the task, assisted by my son, with this result: that the total combined length of all avenues open to the public is only *one mile and three-quarters*, and that there may be a mile or more additional of by-ways and tortuous crevices never shown to tourists; hence the owners are warranted in their honest advertisement that the entire length is about three miles.

The swiftness of the cave stream, and its liability to sudden overflow, must have prevented the aborigines from making this cavern a place either of residence or sepulture. It may be doubted, indeed, if they knew of its existence. Few animal remains have been found here. Large numbers of

bats, however, hibernate in its chambers, clinging in clusters, like swarms of bees. No fish inhabit the lake or the stream, except such as have been put there by the hand of man, and even these forsake these subterranean waters when the spring freshets give them the opportunity to do so.

It should be said, in conclusion, that while Howe's Cave is far surpassed by several caverns in the subcarboniferous limestones of Virginia, Kentucky, and Indiana, it is the largest in this country that has been excavated from the rocks of the Silurian period. Its attractions are very considerable, and some of them are unique and highly remarkable. The cave is well worth visiting, especially as it is so easily reached from New York and the New England States. Its environs are picturesque, and from the piazza of the hotel a wide and beautiful view is commanded of the fertile valley of the Cobles-Kil, beyond which rises the wooded summit of a spur of the Catskills.

#### RECENT INVENTIONS.

An improvement in that class of ironing table that may be folded compactly together when not in use, so that it may be placed out of the way, has been patented by Mr. William G. Lindsay, of Winnebago, Wis. The invention consists in pivoting or hinging the ironing board to the ends of one of a double pair of hinged or pivoted cross legs, and securing to the under side of the board a ratchet-toothed spring bar, upon which the round of the other pair of cross legs may be placed at any required distance apart, by which means the height of the table may be adjusted.

An improved clasp for albums of all kinds, Bibles, and other books, so constructed that it may be easily closed even should the book be overfilled, has been patented by Mr. Carl Posen, of Offenbach-on-the-Main, Germany.

A water seal cup for waste pipes for refrigerators and for other purposes has been patented by Mr. Sylvester Gray, of Long Island City, N. Y. The invention consists in the combination of a bent wire with the water seal cup and the waste pipe, by which the cup is securely and detachably connected with the waste pipe.

An improved harness buckle has been patented by Mr. Robert D. Whitemore, of Chippewa Falls, Wis. The object of this invention is to provide a buckle which shall tighten with a side pressure upon the trace and hold the trace more securely as the strain upon it increases.

Mr. Samuel S. Gible, of Mount Joy, Pa., has patented an improved insect trap. The object of this invention is to protect tobacco planters from the pest of the so-called "tobacco worms" (known as the larvæ of several species of *Lepidoptera* of the sphinx family), by capturing the parent moth prior to laying her eggs upon the plants, from which the worm is hatched. The invention consists in providing a wire trap with eyes or rigidly-attached loops to serve as a means for supporting it upon a staff or pole, and with a looped pendent wire for suspending the bait beneath the open bottom of the trap.

An improvement in the class of devices constituting an elastic or yielding support for thills or shafts of vehicles, whereby they are automatically raised and held elevated when the horse is detached, has been patented by Messrs. Allen C. Smith and Henry W. King, of Canaan, N. Y. In this position the thills are less liable to be broken or otherwise injured, besides occupying less of the available floor space in the carriage house, and likewise facilitating the re-attachment of the horse.

An improved lock for holding reels to fishing rods, which is simple and effective, has been patented by Mr. Henry Prichard, of New York city. The invention consists of a sleeve surrounding the fishing rod, and provided with a notched internal shoulder at its upper edge, which engages with one of a series of studs on the metal casing of the reel. If the sleeve is passed down over the upper end of the plate or strip of metal to which the reel is attached, the lower end of which is passed into a suitable socket, the plate can be firmly locked in the desired position by turning the sleeve.

Mr. Henry O. Koschwitz, of Brooklyn, E. D., N. Y., has patented a method of making buttons and similar articles, consisting in turning the articles in a lathe first in one direction and then in a direction at right angles to the first, and then splitting or cutting the cylinder with rounded ends thus obtained longitudinally into several pieces, which are ground or planed and polished.

Mr. Henri B. Burin, of New York city, has patented an improved velocipede, which is so constructed that it may be used upon land and water with equal facility.

Mr. Thomas Leach, of Taunton, Mass., has patented an improvement in baking dishes applicable to all kinds of analogous covered dishes, such as pickle casters, jewel cases, sugar or butter dishes, etc. The dish has novel means for maintaining the cover of the dish in suspended position above the receptacle.

An improved draught equalizer which is simple, strong, and durable, and can be easily adjusted according to the strength of the animals and the resistance of the load, has been patented by Mr. Franklin H. Standefer, of Fort Payne, Ala. It consists in a doubletree provided with a vertical longitudinal slot, and made adjustable lengthwise on the doubletree bolt by means of a screw.

An improvement in gloves has been patented by Mr. Remus D. Burr, of Kingsborough, N. Y. The invention consists in extending the palm of a glove to form the little finger, thumb, and front and sides of middle finger, an obtuse angled cut being made from the base of the middle finger to the opening of the thumb.

Mr. Francis M. Cummings, of Porterville, N. Y., has patented an improved cheese curd sifter and picker, made so as to sift out the fine curd and pick the coarser or lumpy curd into pieces, reducing the curd to the desired fineness to receive the salt evenly with very little injury to the curd and loss of "white whey."

Mr. John Menahan, of New York city, has patented a pocketbook fastening, which is so constructed as to hold the pocketbook securely closed. It consists in a plate having one or more holes to receive the fastening pin and flanges upon its side edges to receive a sliding plate having one or more holes to receive the fastening pin, and slots between its holes to receive the neck of the fastening pin.

An improved hinge for folding bedsteads has been patented by Mr. Herman A. J. Rieckert, of New York city. This invention relates to hinges for folding bedsteads wherein the bed is fitted for being turned or closed into a stand or cabinet. The object is to furnish a hinge which will permit ready removal of the bed from the stand without the necessity of unscrewing the hinge; and this invention consists in a hinge having its leaves formed separate, one being made with the hinge pin as part of the leaf, and the other leaf made with a semicircular recess for the pin.

An adjuster for the slats of window and door blinds, so constructed that the slats can be adjusted into any desired position, and will be securely held in place, has been patented by Mr. John H. Monk, of Brooklyn, E. D., N. Y.

An improved apparatus or sweat house for curing and sweating tobacco to dark colors without developing any unpleasant or empyreumatic odors, which is unavoidable when the curing and sweating are done in the ordinary manner, has been patented by Mr. Charles S. Phillips, of Brooklyn, N. Y.

Messrs. William W. Stratton and Adam Steuerwald, of Columbus, Ohio, have patented an improved cornice for curtains and lambrequins, which can be adjusted to suit any desired opening or space, such as a window, door, niche, and the like.

A labor-saving and effective process and apparatus for simultaneously softening and stretching hides and leather, has been patented by Mr. William Coupe, of South Attleborough, Mass. The invention consists in the application of revolving pin blocks to the surfaces of hides and leather in such a manner that the whole surface of the hide or leather is pressed or acted upon by the pins, and thereby stretched and softened.

An improved bag tie has been patented by Mr. Lewis A. Fish, of Faribault, Minn. The invention consists of a double-eyed double hook, whose hooked end is formed by bending the end up at right angles to the shank, then along the shank of the hook and parallel therewith, then upward again at right angles, and finally back on itself and parallel with the shank, and whose eyes are formed on the other end of the shank by loops extending laterally on either side.

Mr. George Oliver, of the City Road, County of Middlesex, England, has patented a novel apparatus for use in theatrical and other performances for suddenly raising a performer to a considerable height from the stage, the apparatus consisting, mainly, of an assemblage of vertical springs arranged overhead, the performer being connected thereto by a fine wire or rope. The object of this invention is to render the apparatus available for use in theaters or other buildings where there is not sufficient height to admit of the springs being placed in a vertical position.

A method of producing distinct and artistic patterns on pearl buttons has been patented by Mr. Charles L. Woodbridge, of Brooklyn, N. Y. The invention consists in first painting or sizing on the surface of the button, with some substance not soluble in a nitrate of silver solution, the pattern that is to be produced; then a solution of nitrate of silver is applied with a brush to the whole surface of the button, and the button then exposed to the light. The actinic effect of the light soon changes the color of the nitrate of silver either to a light brown or a darker color, according to the duration of the exposure and strength of the solution. Then the paint or size is washed off with spirits of turpentine or other solvent, and the design is thus left clear and distinct in the natural color of the button on the face of the button, after which the design may be further wrought out by engraving and gilding.

Mr. Lucius S. Edleblute, of Cincinnati, O., has patented an improvement in the class of thill couplings or shackles in which the thill irons are adapted to be detached from the axle clips when raised to a vertical position.

#### How Church Tower Clocks are Wound.

The oldest tower clock in the city is in St. Paul's steeple. It was made in 1778 by John Thwait, of London. The clock in St. John's Church was put in the tower in 1812. The Trinity clock was placed in its lofty station, 200 feet from the pavement, in 1846, by James Rogers. In dry weather this clock runs well; but in damp, chilly weather it sometimes stops, owing to the precipitation of moisture on the wheels. Originally two men were required to wind it, each of the three 1,500 pound weights having to be lifted over 50 feet. Some time ago the winding gear was changed so that one man can now wind it.

Describing the operation of winding, the clock-keeper said, the other day: "The crank is about 20 inches long, and when I turn it around I make a sweep of 30 inches. It's a good deal harder than turning a grindstone, but the machine has a ratchet, so that I can stop and rest when I want to. The crank has to be turned 750 times to turn the barrel 21 times.