amount to the present time is estimated at about twelve millions.

The exhibition of the coming year is introduced under the special patronage of Sir Bartle Frere, Governor of the colony. Its programme includes almost every article of export: Class 1. Preserved meats, fruits, vegetables, etc., condiments, preserves, wines, beer and spirits, corn, flour, etc. Class 2. Chemicals, perfumery, medicines, surgical appliances; oils, soaps and candles, paints, colors, inks, varnishes, glue, starch, blue, black lead, etc.; surgical and dental instruments and appliances; tanning matters, disinfectants, insect destroyers, etc. Class 3. Furniture and upholstery of all kinds; glass, porcelain, earthenware, household utensils, and small wares of all kinds; sewing, washing, and other domestic machines; toys and games; writing-desks, work-boxes, etc.; shop fittings, show cases, etc. Class 4 includes all kinds of clothing and fabrics, watches, plate, and jewelry. Class 5. Vehicles, tents, and anything connected with traveling, emigration, and camp life. Class 6. Tools, cutlery, and needle goods. Class 7. All the machinery and materials of construction. Class 8. Agricultural implements and materials of all kinds. Class 9 is devoted to science and education, and includes books, maps, printing machinery, etc., instruments, apparatus, and materials. Class 10 embraces tobacco, cigars, etc.; aërated water apparatus, beer engines, etc.; ropes, cordage, boats, etc.; fire extinguishers, and papier maché ornaments.

The Wreck of the U. S. Steamer Huron.

The United States steamer Huron, an iron gunboat of 1,020 tons measurement, recently, during a heavy storm, ran ashore at Kitty Hawk, on the coast of North Carolina, some 35 miles south of Norfolk, and was totally wrecked. Out of 138 persons on board, but 34 are known to have been saved. The disaster occurred during the night, and only about twelve hours after the ship had sailed from Norfolk. The cause seems to have been the entanglement of the vessel in a shorewise setting current which carried her nearer land than her navigator supposed her to be. The heavy sea prevented accurate sounding, and the dense fog rendered the shore invisible, so that the first intelligence received of the ship's peril was her contact with the bottom, which was followed soon after by her bilging.

The large proportion of lives lost will give rise to the question of what means of safety the vessel was provided with, and why the same were not of more avail. It seems that there were a few cork jacket life-preservers—articles of great rarity on board of a man-of-war—but beyond these there were a small balsa life-raft, which proved of little utility, and the boats, which were of none, as they were unable to live in the surf. Although the wreck was quickly known to people on shore, and a large crowd gathered on the beach, no method of communicating with the wreck was at hand; while the crew of the stranded vessel, although abundant time seems to have been afforded, were unable to get a line ashore. Although numerous devices have been suggested for sending ropes to land from wrecks, notably by kites, it would seem that still simple means of communication are necessary. A new adaptation of men-of-war's cutters as unsinkable and uncapsizable life-boats would be of utility. The arrangement must be such that the space in the boat necessary for transportation of men, provisions, etc., is not cumbered with large air cylinders or similar devices, nor must the arrangement be such as will interfere with the ordinary every-day use of the boat. A life-preserving jacket, which might also serve as a waterproof dress in bad weather, might also be a useful device, and if such were invented, of sightly appearance and capable of easy storage, the Navy Department could be asked to consider the propriety of its being made a part of the regulation uniform outfit of naval seamen.

AN EASY METHOD OF PRODUCING BAS RELIEFS.

The production of patterns from which to cast ornamental articles is confined to a class of artizans who, by long experience in carving and modeling, have attained great excellence in workmanship. An amateur, while he may not hope to attain to such excellence, and cannot expect to produce, by the usual processes and with limited practice, such exquisite articles as may be seen in many of the city shop-windows, may, if he possesses even a modicum of artistic taste and skill, do something in that direction for both pleasure and profit, by observing the following directions:

The articles required to carry out the process are some thin sheets of semi-transparent wax,* a knife having a narrow, dull blade, and the printed or drawn design of the form to be produced. The backing, or surface on which the relief is made, may be of any of the materials of which patterns are commonly made.

Having given the backing the required form and located thereon the position of the relief, a sheet of wax is laid over the design and the extreme outline of the figure is traced on the surface of the wax with a dull point. The wax is now laid upon a smooth board and cut upon the line just made with the knife, the blade being slightly warm. The wax thus cut is now placed on the foundation or backing, and fastened by heating the knife blade quite hot and touching the wax at several points, so as to cause it to melt and adhere to the backing. Supposing this piece of wax to have the thickness required in the thinnest portion of the relief, another sheet is laid upon the design and traced within, and a small distance from, the outline of the design. It is cut and laid upon the first piece and made to adhere by pressing it down slightly.

Fig. 1.

Fig. 2.

Another sheet of wax is traced within the outline of the second, and cut and placed upon the two already secured to the backing, and so on until the design is produced in what might be termed the *rough*. This stage is illustrated in Figs. 1 and 2, which are respectively front and edge views, which give the idea of the arrangement of the several sheets.

Fig. 3.

After the sheets are placed upon one another in the manner first observed, the edges may be burnished down by the rounded back of the knife, or by any smooth rounded implement, which must be slightly warmed.

Superfluous wax may be removed by scraping when cold, and indentations and interstices may be filled by adding a little wax. A scroll design is shown in Fig. 3.

When the model is to be reproduced in metal cast in sand moulds, the wax should be slightly varnished with pattern varnish; but when the design is to be produced in plaster, a mould of plaster may be taken from the model after it has been oiled.

Fig. 4.

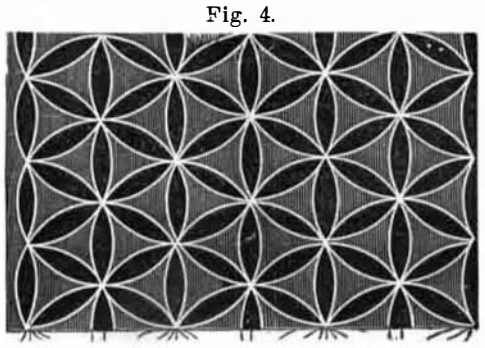


Fig. 5.

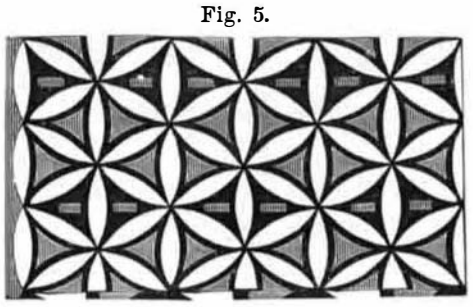
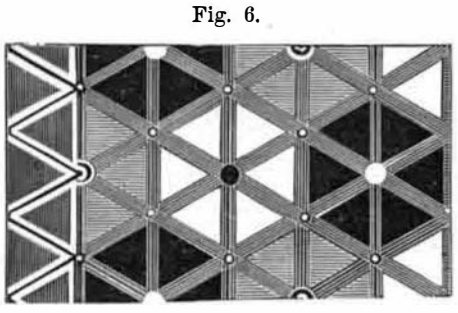


Fig. 6.



A bas relief may be made in this way from a profile photograph or from an engraving.

The process may be employed to advantage in ornamenting patterns for the coarser and heavier kinds of work.

Figs. 4, 5, and 6 represent surfaces ornamented in this manner.

The process is applicable to bas relief ornamentation only, but it is capable of considerable development. G.M.H.

The Sense of Beauty.

There is nothing which more distinctively marks true progress in education than the increasing breadth of view which is taken of the whole subject. Gradually we are discovering that man needs not merely the knowledge contained in text books, and laid down in the various courses of study, but much that must be gleaned from other sources; that he has not only one set of faculties to be developed, but many; and that true culture includes the careful nurture of every part.

Among the hitherto neglected powers of our nature is the sense or perception of beauty. We all have this in its germ, but few of us ever think it worth our while to cherish and improve it. Yet there is scarcely one of our faculties that is so amply provided for in the external world as this. Beauty pervades the entire universe. Mountains and valleys, forests and meadows, skies and oceans are full of it. The more we explore Nature the more do we discover of her loveliness. Science is every day revealing new beauty by her discoveries, and every accession of knowledge opens up charms of which we had never dreamed. Only a small portion of creation can minister to the necessities of the body, and that portion can only be made available by toilsome labor; but the sense of beauty has but to awaken to its own need to find the whole universe waiting to pour upon it the richest supplies. In most cases our desires far outrun their possible fulfilment, but in this it is just the reverse. Here it is the inner sense that needs developing to respond to the wealth of beauty that awaits its recognition. It is as if, in an exquisite palace, filled with choicest pictures and statuary, and adorned with everything that taste could suggest to make it attractive, the inhabitants were partially blind, and could barely distinguish one article from another, much less comprehend the loveliness by which they were surrounded. The world is full of beauty that we barely see, or seeing yet fail to understand or to enjoy.

It may, however, be questioned whether, after all, it is so important that this sense should be quickened and sharpened into keen appreciation. It does not help a man to earn his living, or to grow rich; it does not give him standing in society or political power; it does not add to his stock of knowledge, or enable him to fight the battles of life with any more success. It is true that it does not directly promote these results, though through its culture some of them may be indirectly aided. Yet these are not the only things in life worth pursuing, though in our materialistic age we are apt to think so. The joy that beauty confers is of itself no mean or trifling thing. Pure and innocent pleasures are the best safeguards against unwholesome excitements. He who early learns and retains the habit of enjoying external beauty, and letting its influence sink deeply into his nature, will not be greatly exposed to temptations of a gross or sensual nature. Beauty is eminently refining, purifying, ennobling. As the eye which perceives it is the most delicate and sensitive of all the bodily organs, so the inner sense which responds to it is the most tender and refined of all the faculties. To cultivate and develop this sense is then to exalt the pleasures, to purify the desires, to refine the feelings, to ennoble the aims. No one can expand and intensify his sense of beauty without being a better man, and breathing out a sweeter influence than before. It may be, as Socrates declares, that outward beauty is but the emblem of expression of what is lovely, grand, or noble in the unseen or spiritual world. Certain it is that they are closely akin, and they act and react upon each other with the most perfect harmony.

Whoever is imbued with the sense of beauty will involuntarily create it around him. It will give a grace to his demeanor, a fitness to his words, a harmonious proportion to his conduct. Good taste and consistency will shine in his domestic arrangements and in his business affairs. Unconsciously, by his intercourse, he will develop the same power in others. Partaking of his pleasure and enthusiasm, they also will respond to the beauty around them with fresh joy and fervor. Let us, then, no longer neglect the culture of this important part of our nature. Let us open our eyes and our hearts to receive all the beauty that they are capable of taking in; let us welcome its pure delights, and hasten to shed them on others: let us give it a place in our daily life and thoughts, and let its presence ever dwell in our homes, to bless and purify them.—*Phila. Ledger.*

A Mammoth Barrel Factory.

The Standard Oil Company is constructing at Pittsburg a factory for the manufacture of barrels for its own use. The building will be 300 feet square, and supplied with the latest improved machinery for making barrels, with a capacity of turning out 5,000 to 7,000 barrels a day. The establishment, it is calculated, will cost about $50,000. In connection with this immense cooperage there is being erected a huge agitator, to be used in completing the process of refining oil, and to which the oil will be conducted by means of pipe lines, and barrelled. These establishments will have the effect of making the locality an extensive shipping point.

* For complete directions for making sheet wax, see SCIENTIFIC AMERICAN SUPPLEMENT, No. 17, "Casting, etc."

Manufacture and Uses of Bird Lime in Japan.

The following extract, which is taken from the Hiogo *News*, is inserted by Consul Annesley, in his report upon the trade of Hiogo and Hsoka. Although bird lime may be obtained in small quantities in other countries, still Japan may perhaps be considered the only country in the world in which it is regularly manufactured on a large scale, and as an article of some commercial importance, the production of which gives employment to some thousands of people.

The Chinese characters used to express the word "mochi," sometimes called "tori-mochi," to distinguish it from "mochi" (rice cake), give an excellent idea of the nature of the article, and may be freely translated "bird-catching, sticky substance." It was first manufactured at a place called Yoshino, in the province of Yamato, and the manufacture has spread thence over the whole of Southern Japan, being limited in the locality by the habitat of the trees from which the article is made. The date of its discovery it is certainly difficult, and perhaps altogether impossible, to obtain, some placing it 500 years back, and some only 300. It is, however, certain that, within the last twenty years, the quantity that has been brought into the market has been perceptibly affected through the destruction of the trees, by denuding them of their bark for its manufacture. The Japanese have made some attempt to arrest this destruction by leaving, in a particular manner, a certain amount of the bark on the trees, with the hope that they might serve a second time; but it is found that the article made from this second bark is of very inferior quality.

Osaka is the great center of the mochi trade; large stocks of it may be found, anomalously enough, in the hands of the Kane-Cutsaya (dried fruit merchants), who have their headquarters in and about Tema. Its present value is about 13 yen to 16 yen per picul (133⅓ lbs). The best kinds, which are distinguished by being free from bark, of a dull whitish color, extremely viscid, and having a very gummy consistency, come from the provinces of Yamato, Kischin, Tosa, Aiva, and Igo, an inferior quality being made in Satsuma, Chosin, Bungo, Isé, and Mino, the two latter places being the northern limit of its manufacture. All found north of these provinces is imported from Osaka and places south of that port. The best kinds are said to keep good for any length of time. The principal tree from which this bird lime is made is a dark evergreen, having its habitat in the southern half of Japan; it grows high up the shady side of deep mountain glens, and is frequently used by the Japanese as an ornamental shrub; in fact, it may be seen in the ornamental grounds of the Osaka Railway Station. Its bark is of a grayish-brown color, and roughish texture; the leaves are opposite, smooth, dark green, rather more pulpy than the English holly leaf, ovate-acuminate in form, have an unbroken linear edge, a very short petiole, and almost imperceptible stipules. Its efforescence is a panicle, centripetal in its development, having small, white, wax-like diandrous and monopetalous florets, which are also slightly cruciform.

The manufacture of bird lime extends over a period of several months, commencing about June, when the bark of the mochi trees is stripped off and macerated in water for about forty days, after which it is collected and beaten in a mortar, exactly in the same manner in which rice is cleaned. The pestle, however, is of a different make, being shod with iron, the flat under surface of which is armed with spikes projecting downwards. When the pulpy mass under the pestle becomes glutinous, it is taken out and washed in water. This is done to remove as much as possible of the rough outer bark, and the pulp is then again pounded and treated in a cauldron with hot water, on the surface of which it floats. During this treatment it undergoes continual manipulation at the hands of the workman, for the purpose of disengaging the remaining particles of bark, which sink to the bottom of the boiler. This is the most difficult part of process, as considerable skill and experience are required in the workman to keep the stuff from adhering to his hands. After this it is again washed in cold water, and the pounding, boiling, and washing are again repeated until the material becomes sufficiently clean and pure. During the above process about nine tenths of the weight of the raw material is lost, 250 catties of the latter not turning out more than 25 of good bird lime.

The uses to which this article is put by the Japanese are more extensive and diverse than one would suspect, its prinpal one being, of course, for the snaring of birds and animals. By its means animals as large as monkeys are caught. When they once get the stuff upon their paws they soon cover themselves with it, and so exhaust themselves in trying to get rid of it that they fall an easy prey. Birds also as large as ducks are taken, and by a very ingenious process. The young shoots of the fugi (*Wisteria*), which attain considerable length, and are strong, light, and flexible, are gathered, dried, and knotted together in one continuous length. This is smeared with bird lime, and floated out to sea, when very often in the morning, as the writer has witnessed on the eastern coast of Choshin, the hunter is rewarded with several birds. It is a very inexpensive method of bagging wild fowl, as the tackle will serve any number of times till the bird lime dries, when it is easily replaced. Small birds are caught in various ways, some by means of a decoy bird concealed near a patch of tempting feed, which is plentifully planted with little splinters of bamboo, like large needles, the upper half of which is covered with lime. Others are caught while on trees by means of a long, slender bamboo, the top of which is anointed with the lime, and then stealthily thrust against their feathers. Rats are easily caught by spreading a small quantity on a piece of board or paper, and placing it near their holes. It is spread upon a bamboo leaf, and universally used throughout Japan during summer, for catching flies or other insects. The writer has even seen a flea trap made of it, and used by the Japanese in bed. This trap looked more like an English toast-rack without a handle than anything else, simply a piece of board with the lime spread over its upper surface, while over this semicircles of bamboo were fixed at some distance apart, to prevent the bedding, etc., from getting smeared with lime. Should the vivacious insects happen to get on to this during their noctural frolics, their fate is as surely sealed as that of a little fish in the embrace of an octopod.

Another use of bird lime is for medicinal purposes. In certain diseases of the eye it is taken in small pills or dissolved in hot water. It is also used for those complaints of the pelvis which the Japanese call "senke;" it is considered one of the best cures for flesh wounds, cuts, etc., and is almost universally used in the manufacture of plasters. Both water and oil are used in its manipulation, to prevent it sticking to the fingers, but it is generally handled with a stick. It can be purchased at any greengrocer's ("yawoya") store throughout Japan. It might be as well to mention that a very inferior quality of bird lime is made out of wheat by most of the "fuga" (makers of wheaten food); it soon loses its properties and becomes useless.

THE LIMITS OF NATURAL KNOWLEDGE.

In an address delivered at the Munich meeting of the German Association, by Professor C. von Nägeli, on "The Limits of Natural Knowledge," the lecturer maintained that the solution of the question: In what way and how far may I know and understand Nature? is evidently determined by the answers to three questions: (1). The condition and capacity of the intellect; (2). The condition and accessibility of Nature; and (3). The demands which we make of knowledge. In regard to the capacity of the intellect, were it not for our five senses we would not know at all that there is anything besides, nor indeed that we are in bodily existence ourselves. With regard to the completeness of sensual perceptions there is another boundary which is not generally thought of. Scientific analysis shows that each particle of matter influences and is influenced by every other particle, according to distances. The theoretical possibility, therefore, exists that the human organism may obtain bodily perceptions of all phenomena in Nature. In reality among the beings known to us certain parts have developed themselves into organs of sensation, which are extremely sensitive for certain natural phenomena. As Darwin says, in organic Nature only such arrangements attained full development which were useful to the individual bearer. We are endowed, for instance, with great sensitiveness for temperature; it is necessary for our existence, otherwise we might perish through cold or heat without knowing it. We are very sensitive towards light; it acquaints us in the best and quickest manner with all objects which surround us and which may be useful or dangerous to us. On the other hand, we are not organized to perceive the electricity which surrounds us; and were it not for accidental experiences, which revealed it to us, we should have no idea of that force which undoubtedly plays the greatest part in organic and inorganic Nature. Our senses are indeed only organized for the requirements of our bodily existence, but not to satisfy our intellectual cravings. We cannot rely upon our sensual perceptions acquainting us with all the phenomena of Nature.

There are, therefore, two important limits to our perceptions of Nature. On the one hand we are probably deficient of the power of sensation for whole domains of natural life; and on the other, as far as we really have this power, it is confined in time and space to an insignificantly small part of the whole. By conclusions from facts which were recognized by the senses, we arrive at facts equally certain which can no longer be perceived by the senses. The hope of conquering the entire domain of Nature by the reason can, however, never be realized. As the effect of a natural force decreases with the distance, the possibility of knowledge also decreases as the distance of space and time increases. The confined capacity of the intellect, therefore, allows us only an extremely fragmentary knowledge of the universe.

In passing to the second question, we find that the difficulty which Nature opposes to human knowledge is her endlessness of time and space, and of everything which depends on this as a necessary consequence. We cannot conceive her as a whole, because a process of conceiving which has neither beginning nor end does not lead to conception. On all sides uninvestigable eternity bids the investigation categorically to stop. As soon as man wishes to overstep this domain, and wants to form some conception of the whole, he falls into absurdities. Whenever our finite reason wishes to raise itself to conceptions of the eternal in however logical a manner, its wings become paralyzed, and, like a second Icarus, before the sunny heights are reached it falls back into the depths of finite and obscure ideas.

The third question regards "the demands which we make of knowledge." As all conceptions which we form of Nature are exclusively the results of sensual perception, our knowledge cannot go further than to compare the phenomena we have observed, and judge them with reference to one another. We understand something perfectly if we create it ourselves because in this case we see its cause. The only thing in the domain of knowledge which, based upon our sensual perceptions, we can accomplish, is mathematics. We can also understand real things with certainty, as far as we find mathematical ideas realized in them. Our knowledge of Nature is therefore always a mathematical one, and consists either in simple measurement, as in the morphological and descriptive natural sciences, or in casual measurement, as in the physical and physiological sciences. To understand a natural event means nothing else, as it were, than to repeat it in thought, to reproduce it in our mind.

We can thus only know what our senses acquaint us with, and this is limited in time and space to an infinitesmal domain. Of all that is endless or eternal, of all that is stable or constant, of all absolute difference, we have no conception. Of that with which we are acquainted at all we can only know what is relative and differs by degrees, because we can only apply mathematical ideas to natural things. Professor Von Nägeli sums up in the words: "We can only know the finite, but we can know all the finite which comes within reach of our sensual perception."

New Inventions.

An automatic fan and fly brush has been patented by J. B. Boone, of Galveston, Texas. It consists of a fly brush attached to a shaft with rotary-reciprocating motion communicated to it by a clockwork device. The spring has strips of paper attached to it and fans are affixed to the revolving shaft which works in a supporting plate attached to the ceiling.

John W. Drake, of Toronto, Ill., has invented an improved lamp shade and reflector. The shade has a conical top section and a lower supporting section of inverted conical shape. The lower section has at one side a large opening for the exit of the light, which opening may be enlarged or diminished by ring-shaped sections. At the opposite side of the of the lower section is arranged an adjustable and detachable reflector, for throwing the light through the opening of the shade. A strong light can thus be thrown to any point.

An insole patented by J. K. Gittens, of Brooklyn, N. Y., consists of sheepskin with wool for the inner layer, heavy paper for the intermediate layer, and heavy japanned drilling for the outer layer, gummed together, and bound with a worsted or silk binding. It does not wrinkle.

Mr. Frederick Becker, of Hokah, Minn., has devised a new window shade in which thin strips of wood are connected together, tilted to shut out or admit more or less light and raised by cords passing over pulleys or rollers near the top of the window.

An instrument for cleaning telegraph wires, patented by Joseph Walsh, of New York city, consists of a long tube fitted with knives and springs. When it is placed around the wire and moved along, the device cuts away all obstacles such as kite strings, and clears the wire.

A Tap Attachment to Beer Barrels has been patented by J. H. Bruns and Henry von Dehsen of New York city. It consists in an externally threaded cup which screws into the barrel head. The cup has an apertured bottom, into which is screwed a faucet, which is threaded at its outer end, to receive the coupling by which it is connected with the counter beer faucet. The plug of the faucet is placed midway in the cup and is moved by a pin. The cup has a screw cover, which when removed and the plug turned permits the beer to pass.

Owen W. Taft, Brooklyn, N. Y., has patented a Bird Cage. It consists in a bird cage body made in detachable parts and arranged to be held in its complete integral form by a tension exerted either individually or collectively upon the several wires constituting the same. In practising the invention, numerous modifications of the same may be made all tending to the same result, but the preferred form is that in which each wire has formed in the same a spiral coil which gives an individual tension for each wire to hold the detachable cap piece, standards, and base ring together, to form a complete bird cage body.

Sylvester Root, of Kentland, Ind., has invented a Fire Escape, which consists in an apparatus so constructed that persons may be lowered from a building to the ground by means of a chain or rope, and the latter will then be automatically drawn up again to facilitate the descent of other persons. The means employed consist of the chain with waist belt attached, a drum for winding and unwinding the chain, and spring power and brake apparatus for regulating the action of the drum.

A Chair Seat and Back has been patented by Paul Rath, of Jersey City, N. J. It consists of a molded pasteboard seat or back, having a central hole, stuffing, and covering, in connection with a separate pasteboard section bolted thereto, and carrying auxiliary springs, to increase the elasticity of the stuffing. It furnishes a light and useful seat.

A Bougie invented by Stephen St. John, of Port Jervis, N. Y., consists in a compound of gelatin or isinglass and glycerin, thoroughly mixed together in proportions varied accordingly to the quantity of the ingredients and the requirements of the species and intensity of the disease. The compound thus made is then formed into cylinders, and medicated to suit different purposes.

A Dress Elevator has been patented by Emil C. Calm, of New York city, by which the dress may be supported at any elevation, and adjusted with great facility. It consists of the connection of the hook by which the dress elevator is attached to the belt, and of the chain to which the dress-holding clamp is applied, of a pulley or other guide device connected to hook, and of a suitable chain-retaining device.