

by Mr. John B. Hampton, of Pomeroy, Ohio, consists of a bar adapted to be fastened to the bridle by rivets, having a slot through it and on either side thereof underneath a transverse recess for the reception of the studs projecting from either side of the end of the loop, which are passed through the slot in the plate, and then turned so as to rest in the said recesses, and thus form a swivel joint.

Mr. James McMurray, of East Portland, Oregon, has patented an improvement in cooking utensils. The object of this invention is to provide kettles, saucepans, and other cooking vessels with straining and steaming attachments, which shall be so constructed that they may be readily applied to the said vessels, and attached and detached, as required, and which shall be simple in construction and inexpensive in manufacture.

An improved machine for washing and beating silk and other threads and yarns when in the skein, has been patented by Mr. George Morlot, of Paterson, N. J. It is simple in construction and convenient and effective, removing all loose fibers and foreign particles, and forcing the water into and through all parts of the thread.

An improved tire shrinker has been patented by Messrs. George H. Stroud and John A. Shuman, of Sugar Run, Pa. The object of this invention is to provide a tire shrinker that will work effectually, and yet require no great exertion of power. It consists in combining with a movable plate and jaws a forked connecting rod, pivoted to the jaws, and a lever operated disk.

An improved brake for baby carriages, patented by Mr. William F. Wallberg, of Brooklyn, N. Y., is so constructed as to lock the wheels automatically whenever the handles are released, so that it will be impossible for the carriages to start forward accidentally.

An improved signal lantern, patented by Mr. Thomas S. Easterbrook, of Toledo, O., consists of a lantern globe having two opposite quarter sections colored, and the two intermediate ones uncolored, which globe is set in a lantern frame that has attached to it two quarter section metallic plates that are set opposite each other, so that by turning the globe the colored sections or lights of the globe may be covered by the plates and the uncolored or white lights only be shown, or the colored light be shown and the white be covered.

An improvement in window blind fasteners has been patented by Mr. William H. B. Allen, of Cambridge, Mass. This invention consists in a blind or shutter fastener operating to retain the blind open or closed and fitted for convenient manipulation. The inventor makes use of a pivoted catch and lever hung on the stile of the blind, which locks with the hinge staple to hold the blind in either position.

An improvement in dumping carts has been patented by Mr. George B. Wiestling, of Mont Alto, Pa. The object of this invention is to furnish carts, wagons, cars, and other vehicles so constructed that their bodies may be raised vertically, and also set in inclined positions, to facilitate the dumping of their contents.

The Eclipse of the Sun.

The line of totality of the eclipse of Sunday, January 10, crossed Central California and Southern Nevada, and penetrated nearly to the Great Salt Lake in Utah. Only in California, however, could favorable observations be taken, because the eclipse occurred so near sunset. Prof. Frisby, of the United States Navy, was sent, with a corps of observers, armed with powerful instruments, to the Pacific coast, and Prof. Davidson, with another corps of observers and a 6½ inch equatorial telescope, more powerful than the one Piazzi Smyth lugged up the Peak of Teneriffe, went into the Salinas Valley, which furrows the coast range, about 200 miles south of San Francisco, and within from 15 to 25 miles of the Pacific. Besides these, many private observers made elaborate preparations for observing the eclipse from various points within the line of totality. Apparatus for photographing the eclipsed sun was plentifully provided.

The first report came from Fresno, about 150 miles southeast of San Francisco, and within ten miles of the line of totality. The weather was perfectly clear. The first contact was visible at 2:45 P.M., and at 3:53 the observation became total.

As the last ray of sunlight disappeared, a corona of clear white light, entirely encircling the moon, flashed into view, brilliant at the edge of the moon and paling toward the outer limit of the halo. Next along the border, on the lower left third of the moon, appeared an irregular fringe of brilliant, sparkling primitive red and purple light, while at the top of the moon there was a bright yellow triangle of light equal in height to one-sixth of the diameter of the disk; a similar but smaller triangle appeared at the center of the right side of the moon, and from the upper and lower right side broad faint rays were projected. This appearance lasted thirty-one seconds, the corona remaining one minute longer. The sun disappeared behind the coast range before the eclipse had entirely passed.

The only other dispatch from parties of observation, up to Jan. 14, came from Prof. George Davidson, of the Coast and Geodetic Survey, stationed at Mount Santa Lucia (5,700 feet above the sea), just south of Monterey, Cal., and but a short distance from the Pacific Ocean. Prof. Davidson says:

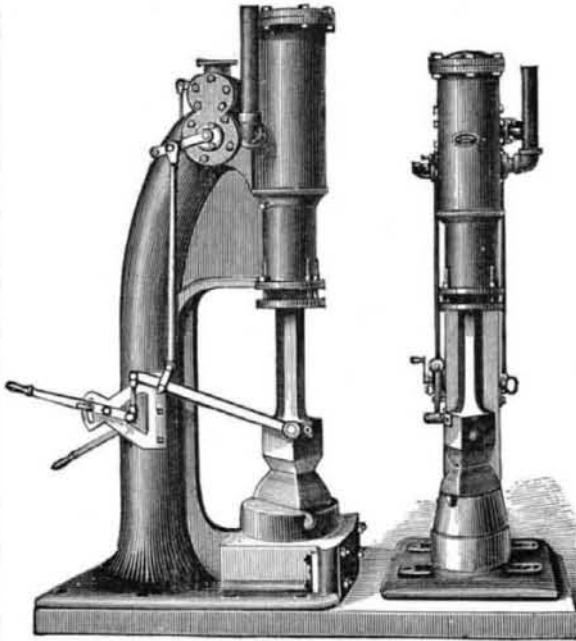
"After five days of fierce winds, rain, sleet, and snow, with a temperature of eleven degrees, the weather cleared on Sunday, and we had good observations both at the beginning and the ending of the totality. The totality lasted thirty-two seconds. The shadow was seen coming over the

Pacific Ocean. There was a brilliant corona and red flame. Latitude and transit observations were obtained.

The United States Naval Observatory party, under Prof. Frisby, at the same station, are said, in a dispatch from Soledad, to have made successful observations. The first contact was within one and a half seconds of computed time.

IMPROVED STEAM HAMMER.

The annexed engraving represents two sizes of an improved steam hammer invented by Mr. David Bell, of Buffalo, N. Y. These hammers are very simple in construction and substantially built. The single column standard, the cylinder, and the bed piece are cast in one piece. The die block is cast separately and fitted in the bed plate.



BELL'S IMPROVED STEAM HAMMER.

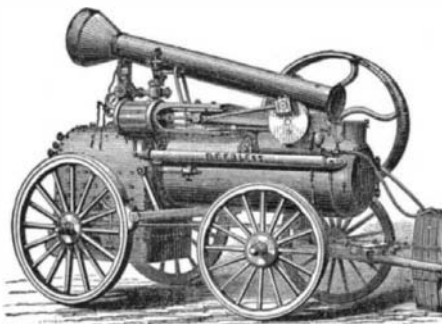
One of the hammers shown in the engraving has an eight inch cylinder and eighteen inch stroke, and the other has a ten inch cylinder and twenty-two inch stroke.

All the parts are very strong, and it is self and hand acting, and takes steam at both ends of the cylinder. The ten inch cylinder at ordinary steam pressure will strike a blow of from four to five thousand pounds. The stroke is perfectly automatic and can be made light or heavy as desired.

The hammer was shown by Mr. Bell at the Exhibition of the Mechanics' Institute held in Buffalo some years ago. The judges reported that it was the best hammer for forging and general blacksmith work on exhibition. Since that time he has made several improvements upon it, so as to perfect the invention, and it is now being used in six of the largest machine shops in Buffalo and also in other parts of the country, and all who have had experience with it pronounce it the best hammer in use.

THE PEERLESS PORTABLE STEAM ENGINE.

The annexed engraving represents a portable engine for agricultural and other purposes, which, in general design, completeness in construction and operation, ranks among the best of its class. It is built with a view to strength, compactness, durability, and efficiency.



THE PEERLESS PORTABLE STEAM ENGINE.

The boiler, which is of the locomotive type, has a fire box of unusual length, and so arranged that the fire is completely surrounded by water. The tubes, which are lapwelded, vary in number in different sizes of the engine, from twenty to fifty-five; in size from two inches to two and a quarter inches; in length from twenty-eight inches to fifty-two inches.

The smoke box, fire door, ash pan, steam blower, smoke stack, and other adjuncts, are neatly and conveniently arranged, and the boiler is provided with the necessary appurtenances, such as steam and water gauges, blow-off cocks, etc. The engine cylinder and the steam chest are combined in one casting, which is bolted at one end to a flange on the end of the frame or bed plate. This arrangement permits of the free expansion of the cylinder, as it rests upon a bracket attached to the boiler, and the boiler is free to expand and contract without straining either the engine or itself.

The saddle or bearings for the crank shaft are of the kind used in first class stationary engines, and are arranged to adjust from four sides, upper, lower, right, and left, with

improved simple arrangement by which the bearings can be adjusted by persons who are inexperienced in the use of machinery, cannot be made too tight, and therefore can never be ruined from this cause. The bearings are made very large, and will run a long time before any adjustment is necessary. The support between the boiler and these bearings is cast hollow, through which all the water while cold, used to feed the boiler, must pass on its way to the pump, absorbing the heat which would otherwise cause the bearings and journals to become very hot. This valuable improvement, covering the new feature of a water passage between the boiler and the crank shaft bearings, for the purpose of keeping the journals and bearings cold, is secured by letters patent. When the water is not required in the boiler, the flow is kept up by opening a valve and allowing the water to return to the tank from which it was taken, thus keeping the bearings always cold, and never allowing the pump to become dry, but always working and ready to supply the boiler with water when required.

The engine and boiler can be mounted on a strong substantial truck or wagon, as represented, or on sills. All the parts are interchangeable, and none but the best materials are used, and the workmanship is of the best.

Further information may be obtained from the Geiser Manufacturing Company, Waynesboro, Franklin county, Pa.

MECHANICAL INVENTIONS.

An improvement in speed-accelerators has been patented by Mr. James Schofield, of New York city. The object of this invention is to convert slow or slight motion into rapid or extended motion by the intervention of ropes or chains and sheaves, for the purpose of propelling boats, vehicles, machinery, and the like. The invention consists, essentially, of a sliding carriage containing several sheaves, and fixed on a reciprocating rod, while over said sheaves and sets of corresponding standing sheaves fixed opposite, and at a distance, a rope or chain is passed back and forth in such a manner that a slight movement of the carriage will produce a very extended or accelerated movement of the bight of the rope or chain, or of objects attached to it.

An improvement in vehicle-wheel hubs has been patented by Mr. Lucius S. Edleblute, of Cincinnati, Ohio. This invention is an improvement in the class of metal wheel-hubs in which the spoke tenons or butts are clamped between flanged collars, one of which is adjustable on the axle-box to adapt it for convenient adjustment or removal, and it pertains to a peculiar construction and arrangement of parts which cannot be clearly described without an engraving.

Mr. Benjamin Slusser, of Sidney, Ohio, has invented an improved elevator for warehouses and other buildings, constructed with a view to securing greater safety against the sudden fall of the elevator platform from the breakage of the rope, and to provide against persons falling through the hatchways in the several floors. The invention consists in a novel automatic clutch for arresting the descent of the platform in the event of the sudden breakage of the rope, and in the peculiar means for opening and closing a set of automatically operated trap doors for the hatchways, which are opened above and closed after the platform in rising, and also opened below and closed above the platform in descending, so that at no time is the hatchway left open.

Mr. Lovren E. Hogue, of Sandy Lake, Pa., has invented an improved injector in which the lifting and forcing tubes are so constructed and arranged with regard to each other that the pressure may range from forty to one hundred and fifty pounds without requiring any change in their adjustment, the said construction and arrangement enabling the quantity of water to be so graded that three or more different quantities of water may be injected into the boiler.

The New Industrial Art School.

The new free school for workers in metal and wood was opened January 13, at No. 31 Union Square, under the management of the trustees of the Metropolitan Museum of Art. The object of the school will be to teach carvers in wood, engravers on gold, silver, steel, and other metals, and others how to design artistically, so as to do away with the old-fashioned method of designing from copy, and in this way to enable the workers to obtain higher prices for their work. The project had been long before the trustees of the Metropolitan Museum of Art, and the establishment of the school is due in great measure to the efforts of Messrs. Robert Hoe, Jr., William L. Andrews, W. E. Dodge, Jr., and Edward C. Moore and Professor Thomas Egleston. The school will be open from 7:30 to 9:30 P.M. The first class will be for workers in wood, and the above named gentlemen have invited workmen from the art establishments of the city who possess a knowledge of drawing and who wish further instruction to attend. A class for workers in metals has also been organized. The students will be allowed to copy from models brought from the collections of the museum. Many manufacturers have promised to do all they can toward making the school a success.

The industrial importance of schools of this nature can scarcely be over-estimated. Wherever they have been undertaken they have shown themselves the most efficient aids in raising the character of industrial art and the social and financial condition of the artisan. It is to be hoped that the young artisans of New York will be prompt to avail themselves of the privileges now offered them.

The Shells of Pompeii.

Dr. Nicola Tiberi, an excellent naturalist, living at Resina, close to the site of Pompeii, has recently published a remarkable and well written memoir on the shells found in the ruined city. The point of view to which he directs attention is very different from that taken by the geologist, antiquary, artist, or architect. He treats of the shells found in the ruins, and which had served for food, or had been used by the Pompeians for ornament and other purposes. We know from Athenæus and other ancient authors that mollusca were then relished quite as much as they are at the present day by the inhabitants of Italy. Dr. Tiberi gives a list of all the shells which he has noticed as Pompeian, belonging to no less than 44 species, with particulars of their relative abundance at Pompeii, as well as of their distribution and economy. Some were of edible kinds, as the common oyster and mussel, *Pecten jacobæus*, *Venus chione*, *Tapes decussatus*, and several species of *Helix*. Others served to adorn fountains, as *Haliotis tuberculata*, *Murex trunculus*, and *M. brandaris*. The Oriental pearl shell (*Meleagrina margaritifera*) was represented by a single valve only.

But the ladies of Pompeii seemed to have attached considerable value to the *Cypræa*, or cowry, as amulets or charms to prevent sterility; and among these shells were some of the species from the Red Sea and the Persian Gulf. A single specimen of another exotic shell (*Conus textilis*) must have been kept for its great beauty as an object of curiosity. All the shells used in the ornamentation of fountains, five in the city and one in the suburbs, are of species which are still common in the Gulf of Naples; and these shells are separately distinguished and named. The memoir, which is a quarto pamphlet of twelve pages (*Le Conchiglia Pompeiane*, Napoli, 1879), forms a short but interesting chapter of Roman history, and tells us more than is generally known about the habits of the former masters of the world.

To Convert Common Agate into Onyx.

Following the attempt to produce minerals and precious stones artificially, comes the attempt to convert one mineral into another, a less costly into a more valued gem. Two Germans have patented a process for converting ordinary agate into onyx. Lorenz and Cullmann place the cut and polished agates for a week in a solution of iron in nitric acid only one millimeter deep, and then treat those portions of the stone which are to be white with a solution of equal parts of carbonate and hydrate of potash, dried, and burned in an earthen pot until the desired color is obtained.

Cannot some of our readers devise a method for converting ordinary feldspar, orthoclase, into Amazon stone? The latter has a bright emerald-green color, which is destroyed by heat, but brightened and intensified by certain hydrocarbons, like turpentine oil.

Different Solvents for Pyroxylene.

In the preparation of collodion the gun-cotton, or pyroxylene, is dissolved in a mixture of alcohol and ether; in the manufacture of celluloid the solvent is camphor. Bardy, the celebrated French chemist, has recently studied the action of other solvents, especially acetone, methylic alcohol, and glacial acetic acid. His results, as reported to the Photographic Society of France, were as follows:

Acetone, a liquid which resembles ether in its volatility, but unlike the latter miscible in all proportions with water, is one of the best known solvents of pyroxylene. It does not dissolve the firm cotton prepared at low temperatures as well as that in dust form made by Martin's process. On pouring the acetone solution into water, the solvent at once unites with the water and the cotton is precipitated in the form of large white flakes, which do not adhere together, and hence can be easily washed. When dry this cotton has a peculiar appearance; three grains of it occupy a space of nearly 200 c.c. It is not actually necessary to employ the pure acetone; if it gives no milky precipitate when poured into water and does not reduce salts of silver it is good enough.

Methylic alcohol, since its introduction into the manufacture of methyl violet, comes into commerce in a state of sufficient purity. It mixes with water in every proportion, and has no action upon silver salts. It dissolves pyroxylene easily, but the solution is more shiny than that in acetone. If poured at once into water it is precipitated as a compact gelatinous mass, difficult to wash out. The solution must be poured into cold water in a very fine stream, then a very voluminous mass is obtained; 25 grains occupy 2 liters of space, and can be readily washed out. On drying, the mass becomes horny, half transparent, and of an amber color. It dissolves readily in the mixture of alcohol and ether.

Crystallizable or glacial acetic acid dissolves pyroxylene, and when poured into water the solution acts like the acetone solution. On drying, every trace of the acetic acid is volatilized, leaving the cotton perfectly neutral. I. Z.

MANY persons know it, but some do not, that a pretty and easily grown window plant may be obtained by soaking a round piece of coarse sponge in warm water until it is thoroughly expanded. After squeezing it about half dry, place in the openings millet, red clover, and barley grass seeds, rice, and oats. Hang the sponge in a window where the sun shines a part of the day, and sprinkle it lightly with water every morning for a week. Soon tender leaves will shoot out, and, growing rapidly, will form a drooping mass of living green. If regularly sprinkled, it will later be dotted with the blossoms of the clover.

On a Curious Case of Crystallization in Canada Balsam.*

BY GEORGE F. BARKER.

Some time in the early spring of 1875, a party of hunters left Rawlins, Wyoming Territory, and went up into the Sweet-water country, a hundred miles north of that town, in search of game. While absent one of the party lost a valuable field glass. In the summer of 1878 a party of Ute Indians came into Rawlins, having in their possession the lost field glass. It had lain out exposed to the weather for over three years, and of course showed the hard usage it had undergone. The eye lenses, however, were in excellent condition, but the achromatic object glasses were covered with an abundant arborescent crystallization, which rendered them quite opaque. My friend, Mr. Galbraith, of Rawlins, who had become their owner, first called my attention to them, and, supposing the crystallization to be in the glass itself, he sent one of the lenses to me as a pattern, in order to have a pair of new ones made in place of the spoiled ones. On examining the lens, however, in connection with Mr. Zeutmayer, it was evident that the crystallization was not in the glass, but in the Canada balsam used for cementing the components of the achromatic. At my request, therefore, the second lens was sent to me, so that by cleaning off the old balsam and recementing, both would become perfect again. The crystalline forms of this second lens were so beautiful that I desired to preserve them. So I applied to Mr. E. L. Wilson to photograph them for me. He took a warm interest in the matter and produced four negatives, one of the first and less beautifully crystallized lens, and three of the other one, each with a different illumination. I present to the Section prints from these exquisite photographs. (The accompanying wood cut has been engraved from one of the best of these photographs.) It will at once be seen on inspection that these arborescent forms are of great beauty, the fineness of the subdivisions being quite remarkable. The most curi-



ous thing about these forms, however, is the fact that they are themselves hollow and are surrounded by the crystallizing material, the balsam. Hence the supposition that we have here the crystallization of some constituent of the balsam is at once negatived. Canada balsam, as is well known, is a complex mixture of two or three resins dissolved in a volatile oil. Now, since one of these resins is crystallizable, it might be supposed that during the intense cold to which the glass was exposed, this resin had crystallized out in these forms. But in that case the crystals would be solid, not hollow. So also of the suggestion that this is a frost-like or dendritic crystallization of some infiltrated material. The crystals in that case would also be solid, unless we suppose their subsequent removal leaving the cavity. But a close examination of the branchlets with a glass shows that they have been formed by a gradual withdrawal of the crystallizing material from several nuclei simultaneously, thus becoming the centers of the radiations. This is evident from the curved lines in the larger branches, concentric with their rounded ends. The most probable hypothesis is that the crystallization has been induced or directed by some constituent of the balsam itself. But the precise conditions under which it has taken place do not seem clear. The building up of a crystal by the aggregation of molecules according to their polarities, or the demounting of a crystal by solvents in regular forms, is simple in comparison. The branchings do not take place at right angles, it will be noticed, but at 80°, which suggests hexagonal crystallization.

Cameo Shells and Cameo Cutting.

The word *cameo* is derived from the Arabic, and is equivalent in signification to bass-relief. It was originally restricted to hard stones, such as onyx, sardonyx, etc., engraved in relief, but the term has since been extended to include gems cut on shell, lava, and other substances. Certain descriptions of univalve shells are well adapted for cameo cutting, from their substance being made up of different colored lay-

* Read at the Saratoga meeting of the American Association for the Advancement of Science.

ers, and also from a difference of hardness and texture, and the various layers—some approaching more nearly to the nature of a nacreous than of a porcelainous material. The good workman always carefully puts his work on the shell in such a manner that the direction of the laminae of the central coat is longitudinal. In cameos the central layer forms the body of the relief, the inner layer being the ground, and the outer the third or superficial color, which is sometimes used to give a varied appearance to the surface of the figure. The cameo cutter selects from the shells which possess the three layers: (1) those which have the layers strongly adherent to each other; (2) those in which the middle layer is thick; (3) those in which there is a good distinction of color between the layers; and (4) those in which the inner layer is of the color suited for his purpose.

The kinds of shells now employed, and which experience has shown to be best for the purpose, are: The "Bull's Mouth" (*Cassis rufa*), which has a red inner coat, or what is known as a *sardonyx* ground; the "Black Helmet" (*Cassis Madagascariensis*), which has a blackish inner coat, forming what is called an *onyx* ground, and which shows up white on a dark claret color; the "Horned Helmet" (*Cassis cornuta*), white on an orange-yellow ground; and the "Queen Conch" (*Strombus gigas*), with a pink ground. The latter shell is about ten inches long, with a rose-colored aperture and an extremely broad lip rounded above. The bull's mouth and the black helmet are the best shells, for the horned helmet is apt to separate from the ground, or to "double," as the French workmen express it. The queen conch seldom has the two colors distinctly marked from each other, and the pink of the ground fades on exposure to light. The red color of the bull's mouth extends but a short distance within the mouth of the shell, and becomes paler as it proceeds inwards. Hence this shell affords only a single cameo large enough for a brooch and several small pieces for shirt studs, while the black helmet furnishes on an average about five brooches and several stud pieces. The queen conch yields only a single good piece. *Cassis flammea*, which is about six inches long, and *C. decussata* and *C. tuberosa*, which are white upon a dark claret color, are also occasionally used. The bull's mouth shells are derived from India and Ceylon, and the black helmets and queen conchs from the West Indies.

Genoa and Rome are the seats of the best work in cameo cutting, although many common ones are cut in France. In Rome there are about 80 shell cameo cutters, and in Genoa 30. The art of cameo cutting was confined to Rome for upwards of 40 years, and to Italy until the last 26 years, when an Italian began the practice of the art in Paris, and now over 3,000 persons are employed in the industry in the latter city. In the practice of cameo cutting the shell is first cut into pieces the size of the required cameo by means of diamond dust and the slitting mill, or by a blade of steel fed with emery and water. It is then shaped into a square, oval, or other form on the grindstone, and the edge finished with oil stone. It is next cemented to a block of wood, which serves as a handle to be grasped by the artist while tracing out with a pencil the figure to be cut on the shell. The pencil mark is followed by a sharp point, which scratches the desired outline, and this again by delicate tools of steel wire, flattened at the end and hardened, and by files and gravers for the removal of the superfluous portion of the white enamel.

The careful manipulation necessary in this work can only be acquired by long experience; the general shape must first be wrought, care being taken to leave every projection rather in excess, to be gradually reduced as the details and finish of the work are approached. Throughout the cutting great caution must be observed that in removing the white thickness the colored ground is not damaged, for the natural surface of the dark layer is far superior to any that can be given artificially.

In order that the finished cameo may possess a distinct outline at all points of view, it is desirable to adopt the system followed in antique cameos, viz., to leave all the edges of the figure quite square from the ground, and not gradually rounded down to the dark surface; for should the latter practice be followed the outline would be found to be undefined in many places, owing to the color of the white figure in relief gradually merging into that of the dark ground. The surface of the cameo is finished as nearly as possible with the cutting tools, as all polishing with abrasive powders is liable to remove the sharp edges of the figures and deteriorate the cameo by leaving the form undefined. When, however, the work has been finished as smoothly as possible with cutting tools, the final polish may be given by a little putty powder used dry, upon a moderately stiff brush, and applied with great care, and rather to the dark ground than to the carved surface. This is the concluding process, after which the cameo is ready for removing from the block prior to mounting.

The various styles in which these works of art are mounted depends a great deal upon the country where they are to be worn. There are tricks in this business as well as in most others; a fraud is frequently practiced by cutting away the engraved part of old shell cameos, and attaching this to a base of agate, by means of which an appearance of onyx is obtained.

As an illustration of the prolific capabilities of our inventors we may say that over 240 patents appertaining to the art of soldering have been granted. In Canada only two patents of the kind have been issued.