A LESSON IN REPOUSSE.

This art, as practiced by the silversmith and artist, is almost entirely dependent upon the manual dexterity of the operator. A kind of repousse is here suggested which depends more upon appliances than skill.

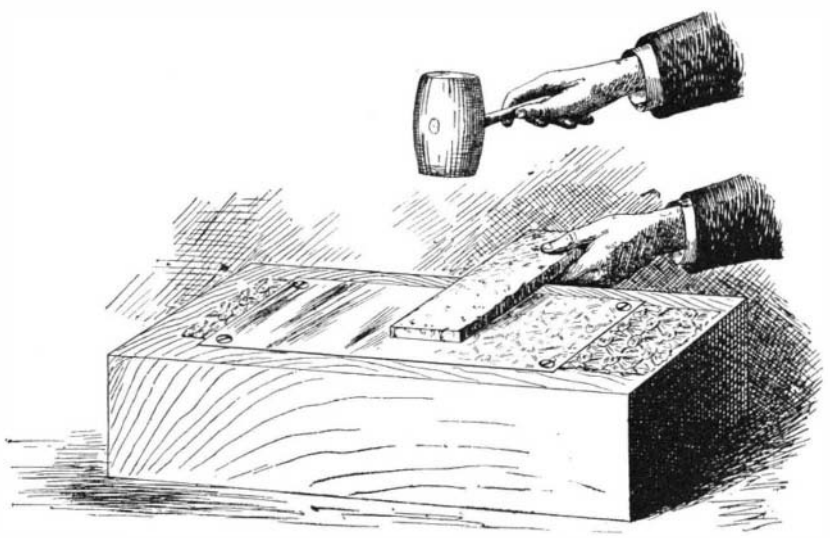

Fig. 1.—EMBOSSING THIN METAL.

It is not, however, assumed that any set of devices can be made to serve in lieu of taste and judgment.

To carry out this method, a piece of heavy cotton lace, or heavy openwork fabric, or a piece of a basket may be glued to a block of hard wood to serve as a sort of die for producing the impression in the metal. The fabric or basket work is not only attached to the block by means of glue, but its finer interstices are filled with glue, so as to present a surface resembling the original fabric only in the most general way. When the glue is perfectly dry and hard, the die is laid upon a solid foundation, and a piece of very thin soft copper or brass is secured to the block so as to cover the lace, as

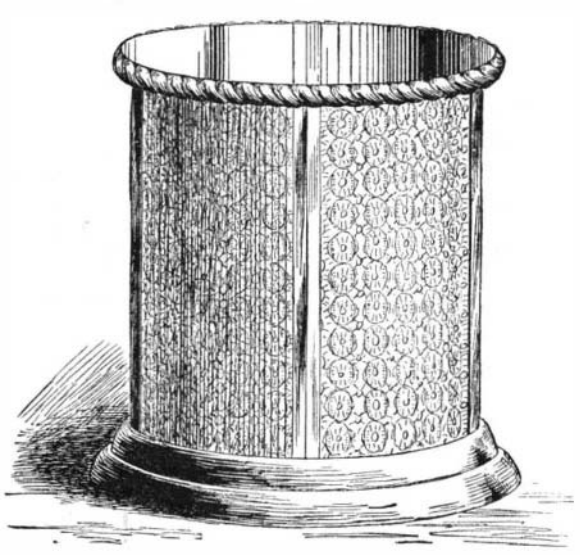

Fig. 4.—VASE FORMED OF EMBOSSED PLATES.

shown in Fig. 1. A piece of cork about one-quarter inch thick and about three inches wide and six or eight inches long is laid over the metal, and struck with a mallet, as shown. The cork yields sufficiently to push the metal down upon the die, and cause it to take the pattern of the lace or whatever is used in forming the die. A piece of rather hard rubber packing will answer this purpose equally as well as the cork.

Designs may be cut from strong paper or pasteboard and glued to the block, or a stencil design may be sawed from hard wood. The lines and scrolls are discontinued in places, so as to cause the wood to hold together. If it is desired to render the lines continuous

Fig. 5.—A BASS-RELIEF IN LEAD, COPPER, OR BRASS.

at these points, they may be run through with a V-tool. Dots are picked out with a small gouge or the point of a revolving drill. In all these cases the metal is attached to the block and treated as shown in Fig. 1.

In Fig. 3 is represented in side elevation and in section a die formed of a small rope glued in a semicircular groove in a bar of hard wood. The embossing is done in the manner before described. In this case a thick piece of soft rubber is preferable to cork for forcing the metal into the depression of the die.

Either panels or continuous strips may be embossed in the manner described, and these are to be used in making frames, vases, and various ornamental objects. If the metal is too thin for a certain case, it may be strengthened by flowing soft solder over the back of the plate by means of a soldering iron.

The vase shown in Fig. 4 is formed of four embossed plates of copper, fastened to the back of four vertical brass strips by solder, the whole being secured to the bottom piece in the same manner. The bottom consists of a disk of copper soldered in. The base is formed of a brass stovepipe collar soldered to the lower part of the body of the vase. The rim around the top consists of a strip embossed on the rope die.

As to finish, any of the several well known methods of oxidizing or lacquering may be employed. This vase is especially adapted for containing a palm or other large foliage plant. The earth and roots may be placed directly in the vase, or they may be contained by a pot which is inclosed by the vase.

It is obvious that vases of other forms and other embossed designs may be made on this plan.

Bass-reliefs may easily be made by a method which is a modification of the one described. Fig. 5 shows such a relief, and Figs. 6 and 7 illustrate the tools required for making it.

To the wooden frame, A, is fitted a board, B, upon which is drawn in outline the design which is to be produced in relief. The board may be of pine or any close-grained, soft wood for lead work; but for brass or copper, the wood should be hard. To the frame, A, is attached the plate of metal by means of screws.

The board, B, is removed from the frame, and the portion of the design which is to form the most prominent feature of the relief is sawed out of the board, when the latter is replaced in the frame, and the metal is forced into the opening of the board by pressing upon the surface of the lead opposite the hole in the board, or by pounding it by means of the mallet, C, shown in Fig. 7. As soon as this feature is complete, the next in order is sawed out of the board, and the operation is repeated until all of the general features are developed. The progress of the work can be observed at any time by removing the board, B.

The features may be corrected or modified by working from either side of the plate by means of the convex mallet and the wooden punches and chisels, D (Fig. 7). If a support is desired for any part while the work is progressing, a stout bag filled with sand may be placed under the part. A few very small bags, say 1 inch or 1½ inches in diameter, will be found convenient. If desired, the drapery or the background may be chased by means of hard wood or metal punches, bearing on their faces the desired figures.

The relief, if of lead, looks well with an antique finish. This may be secured by rubbing the prominent portions of the relief with fine emery cloth, then going over the entire surface with a swab formed of a small roll of cotton cloth encircled by a coil of copper wire, the swab being dipped in dilute nitric acid before application to the relief.

The copper is dissolved and deposited upon the bright prominent portions, while a dark deposit is made in the hollows, which when dry has a green tinge.

To give the work the appearance of antique iron the surface may be blackened by the application of a solution of sulphuret of potassium and the prominent portions may be semi-polished by briskly rubbing the entire surface with a piece of canvas or Brussels carpet.

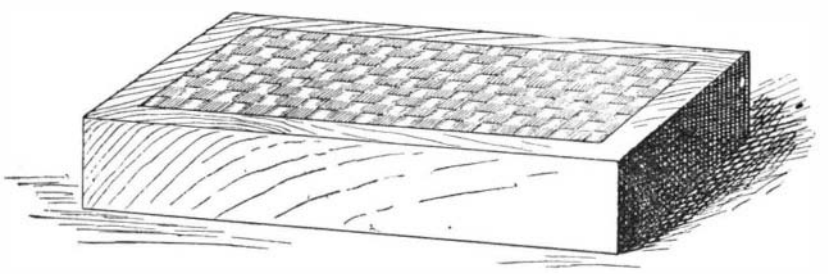

Fig. 2.—BASKET PATTERN.

Fig. 3.—ROPE PATTERN.

Detecting Leaks in Underground Gas Pipes.

A German paper thus describes a method of detecting leaks in underground gas pipes:

Test holes are sunk in the ground along the lines of the gas mains, and half inch wrought iron pipes about three feet long are inserted. In the upper ends of these pipes small glass tubes are placed, each tube containing a slip of paper moistened with chloride of palladium. The test papers turn black under the influence of illuminating gas, the rapidity and distinctness of the reaction depending upon the strength of the palladium solution and upon the volume of escaping gas. Under the most unfavorable conditions, however, an exposure of the test paper for a period of fifteen minutes is considered long enough to show whether or no gas is present. The test holes should be placed about six feet apart, and should not reach below the line of gas pipe. The main object is to penetrate the more or less compact surface material of the

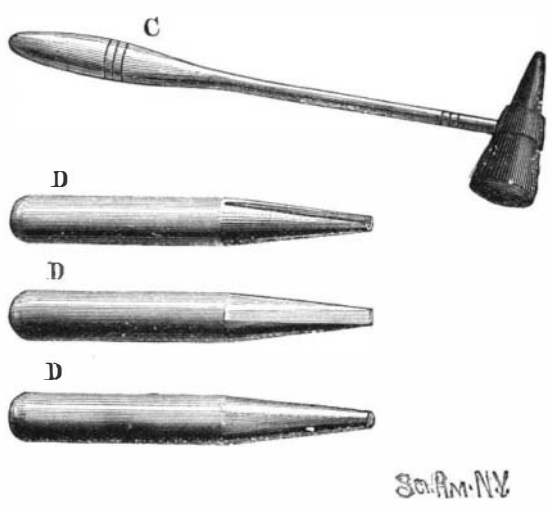

Fig. 7.—WOODEN TOOLS FOR REPOUSSE.

street, so that the gas in the ground has a direct and convenient means of escape. In many of the streets of Frankfort-on-the-Main, especially those having asphalt pavement, one inch pipes lead through the asphalt and the underlying layer of beton, their lower ends extending to within a short distance of the gas mains. These escape pipes are filled with pieces of sponge and are closed with cork stoppers. The pieces of sponge are renewed from time to time. The pipes have been found to overcome, to a considerable extent, the annoyance of digging up the streets for long stretches with the view of locating leaks in the main. —*Boston Transcript.*

Fig. 6.—FRAME AND FORM FOR MAKING BASS-RELIEF.

Another Great Steamer.

The Normannia is the latest addition to the fleet of twin-screw steamers of the Hamburg-American Packet Company, and was built by the Fairfield Engineering and Shipbuilding Company (John Elder & Co.), at Govan, on the Clyde. She is 520 feet long, has a width of 60 feet and a depth of 40 feet, and is of 8,500 tons gross register or 10,000 tons displacement. In appearance she is similar to the other two fast boats of the Hamburg line, the Augusta Victoria and Columbia, having a straight stem and round stern, three huge smokestacks, and two polemasts.

Internally the ship is divided by eleven transverse bulkheads, which are carried to the upper deck, and the twelve separate compartments thus created do not communicate with each other, except on the main deck, which is far above the water line.

The machinery has 16,000 indicated horse power, there being two engines of 8,000 horse power each, which are separated by a longitudinal bulkhead. The engines are constructed on the triple-expansion plan, and have cylinders of 106, 67 and 40 inches diameter respectively, the piston stroke being 5½ feet. The boilers are also placed in separate compartments. The screws have a diameter of 18 feet and are of manganese bronze.

The promenade deck is 400 feet long and has 18 magnificent staterooms, and also the ladies' saloon, music room, and smoking room, fitted up in the most luxurious manner. The main saloon is on the upper deck. This is a magnificent apartment 72 feet long, decorated in sumptuous style, the most ornate and artistic effects being gained by a combination of rare wood carvings and beautiful panel pictures by well known artists.

The steamer accommodates 325 first class, 175 second class, and 175 steerage passengers. Most of the staterooms are on the main deck, a large number of them being furnished in splendid style. There are besides suites of rooms, with private bath and toilet rooms. The conveniences in the second cabin are also excellent and rival those of the first cabin on many other steamers. The steerage is unusually high, well lighted, and divided into small rooms. There is no doubt that the Normannia is one of the finest vessels ever floated.

She recently made the trip from Glasgow to the Elbe at the rate of 21 knots, or 24·15 miles, per hour.

Government Test of Woods.

In compound columns care should be exercised in selecting the sticks which are to form the column. Of course, it would be useless to place a poor with a strong stick, but it is best to place the good together and the inferior by themselves. To make the effects of knots in the resistance of short posts to compression more apparent, some columns, after having been tested and their resistance determined, were cut up and specimens of shorter length taken and tested; the difference in strength was very marked, as was to be expected. An oak column 168 inches long, which yielded at 4,953 pounds per square inch, showed in a specimen 52 inches long cut therefrom 8,450 pounds per square inch, and another 7,794 pounds per square inch, which then gave way at a knot. Another post 164 inches long failed at 3,432 pounds per square inch, but a piece 32 inches long was cut from it, which gave 6,230 pounds per square inch. A yellow pine post, 143 inches long, gave a resistance of 4,663 pounds per square inch, but a specimen 32 inches long was taken from it which had a resistance of 6,230 pounds per square inch. Pieces of smaller size could doubtless have been cut from each of these which would have shown still greater strength, as they might have been obtained more free from imperfections of all kinds. Knots of even small size, firm and sound, exercise an injurious effect upon timber. This was shown in a piece of spruce, from which two samples were cut, one having a uniform, straight grain, the other two small knots; the strength of the former was 11 per cent greater than the latter. "When we come to determine the resistance of specimens having knots to forces of compression at right angles to fibers of the wood, we find the resistance much increased, and this increase should be taken into account when selections for this purpose are possible. The resistance of specimens of a given wood, as compared with others of its kind, is generally indicated by its specific gravity, but this does not always hold good. In yellow pines, some of those rich in turpentine have a high specific gravity, and yet are not the strongest. The rapidity of growth will sometimes give indications of the strength. A rapid growth in oak is apt to be accompanied by an increase of strength, while the reverse is often true in yellow pine."—*Southern Lumberman.*

A Mechanics' Fair.

We are informed that the prospects for a successful exhibition of the Massachusetts Charitable Mechanic Association in Boston, which opens October 1, are very flattering. Space is being rapidly taken up by some of our finest manufacturing concerns and machinery builders. Those who desire to place their products before a New England audience will find this a very favorable opportunity.

The Kangaroo.

BY NICOLAS PIKE.

The great island continent of **Australia**, from its first discovery, has been known as the home and headquarters of marsupial animals; creatures not alone interesting from their peculiarities of form and habits, but for their high geological antiquity. They were among the earliest known mammals, coeval with the great iguanodon and other monsters, and were a prominent feature in America and Europe for ages. During the triassic, jurassic, and great reptilian periods they were numerous, from the giant *dipropon*, as big as an elephant, to the little *antechinus*, the smallest of known animals. Like so many other creatures whose race was run out, so the marsupial mammals became almost extinct, leaving only as types our own opossum and the varied species of kangaroos in Australia and New Zealand, principally the former.

The two largest species are called by the natives the "koorah" and "wallaby," and they are the only large wild animals known there. These are being driven back by constant hunting, till they are becoming scarce in the eastern districts. There are said to be over twenty species of pouched animals in that country, but it is of the above mentioned I propose to speak principally.

The habits of the kangaroos resemble those of the sheep and deer. They are very shy, and have the senses of hearing and smell very acute. They are gregarious, and are seen in droves of 20 to 50, but are then very difficult to approach. They are entirely terrestrial, and when alarmed rise on their hind feet and look about them. When they discover danger, they start off, leaping from fifteen to twenty feet at a jump. They are herbivorous, and during the warm, sultry hours of the day resort to cool, shady bush or forest, where they sleep, sallying forth in the evening for food.

In ordinary weather, the large kangaroos (*Macropius giganteus*) are seen feeding in the daytime, the drove led by an old buck. They eat principally grass, heather, and tender shrubs. The latter they browse on by standing erect on their hind feet. They are especially fond of what is called kangaroo grass, but will also eat barley, oats, or rye if they can get them.

Their ordinary position is a crouching one, on account of the disproportionate size and length of the hind and front legs. When they rise on the powerful hind toes, they often stand over five feet high, and they use their forepaws as handily as a squirrel does to convey food to the mouth. They can go a long time without water and are often found miles away from any rivulet.

A doe has but one young at a birth, although she has three teats concealed in her pouch. About thirty-nine days after conception, the embryo, while still of very small size and the limbs only in a rudimentary condition, is transferred from the uterus to the marsupial pouch, where it is attached by the mouth to one of the nipples, and there it remains till large enough to leave the portable nest in which its fœtal growth is accomplished. The feeble offspring continues to increase in size, from sustenance exclusively derived from the parent, for a period of eight months. After this time its small head may be seen protruding from the pouch and cropping the long grass at the same time as the mother. It lives thus till it is able to run alongside of her, but the instant she scents danger her little one is quickly thrust back into the pouch for safety. The natives call the young *joeys*, and they are pretty little creatures, with their soft silvery fur, sharp ears, and bright eyes.

The kangaroo can be easily tamed, and though a formidable animal to encounter in its wild state, when domesticated it is inoffensive and a very cleanly one. Since 1865 considerable attention has been given to its economic value as regards the use of its meat and skin. In 1874 an attempt was made to domesticate some in England, but being kept cooped up in pens like those of a menagerie, it totally failed. The problem of their acclimatization has however at length been solved, and experiments remarkably successful have been made.

At Tring Park, the residence of the late Baron de Rothschild, a number of kangaroos were brought from Australia and turned loose into the park and woods in hopes of breeding them. Unfortunately a male and young one were poisoned from eating the pernicious Portugal laurel. Fresh ones were imported, and the greatest success has crowned the efforts to breed and acclimatize in England. They have done so well that there are now in Tring Park twenty-eight or thirty native kangaroos, including the black and red species, Bennett's wallaby, the black wallaby and the large *Macropius* or giant kangaroo.

Now, as this curious and valuable animal has been so successfully bred in England, it is astonishing some enterprising American has not already introduced it into the United States. There is no doubt that with the same care that has naturalized the ostrich, kangaroo farming would be equally profitable. It would pay the government to place a few pairs in the Yellowstone Park, where they would be unmolested, and our large Western cattle farmers would do well to try them. It is surprising how little is generally known of the value of kangaroo skins as an article of commerce. Yet in Newark, N. J., 6,000 skins are said to be received every week from New Zealand and Australia for the making of fine shoes and other articles.

Up to 1869 the animals were only killed for their meat, and the skins cut up into shoestrings and leather thongs, etc. An Englishman about this time discovered the valuable quality of the leather and brought some skins to this country. The tanners fought shy of such hides, and he at last got rid of them to a bookbinder for corners for ledgers and commercial books. The valuable qualities soon after this began to be recognized, as the grain prevents its absorbing water, but then it was found very difficult to procure enough skins. Three years ago the establishment now working them in Newark sent out agents to make arrangements for a continuous supply.

It was very soon found that kangaroo hunting was a dangerous business, as when brought to bay it fights bravely for life and leaps like a flash on the hunter, trying to tear open the chest with the terrible claws of the front feet. Seven or eight men go out together, and wear a strong protection on the chest. Then the heat on the plains where the greater species congregate, whose skins are most valued, is often 140°. It is a profitable business all round, especially to the hunters if they escape accidents, as they realize about 70 cents a pound for the hides when sold at the seaports by auction for shipping to America. The trade is at present in the hands of the Newark tannery, who supply all the European markets with the leather, even sending the article back to Australia itself in another form.

Not only are the hides of such value, but its flesh also. The hind quarters of a large buck often weigh over eighty pounds each, and the hams find a ready sale. The tail and head are especial epicures' favorites. The flesh is dark and gamey, and though perhaps not equal to that of our deer, steaks from young animals are juicy and tender and much sought after. As we have every climate within our boundaries, it is quite certain we have all that is required for the kangaroo, and as they have not all the diseases sheep are heirs to, so much the more easy and profitable would be their rearing. As they have such decided grain-eating proclivities, we have another chance in our favor, as every cereal grows in abundance with us.

Since writing the above, I see in the SCIENTIFIC AMERICAN of April 26 there is a short notice of the scarcity of the kangaroo in Australia at the present day, and the rapid strides a great buffalo is making in the northern districts of the country.

The former animal has been as ruthlessly slaughtered there as the latter has been here. Formerly, kangaroos were killed in sport (so called), and in later years from their enormous consumption of grass. The latter fact, to an essentially sheep-producing country like Australia, where wool is their staple product, is of course a great source of trouble to sheep farmers.

The uncertain climate and frequent droughts render the preservation of extensive tracts of grass land of vital importance. Hence we can hardly blame those who kill the interlopers, that are each said to eat as much grass as six sheep.

Now we possess conditions decidedly favorable to the rearing of large herds of kangaroos. We have vast ranges of grass land in many States still, and likely to be only sparsely populated, where they can roam at will. They are easily tamed and become accustomed to their keepers, so they can be trained to return at night for grain food. Just here our illimitable grain crops will come in, and help to make kangaroo raising remunerative where there is a difficulty in realizing fair prices for cereals in the ordinary way, from freight expenses, etc.

How we wonder over the marvelous changes that have taken place in the dissemination and then extermination of so many races of animals! Yet here even in our own day there is a chance that the great bisons, so nearly extinct in America, where they roamed in countless herds, should be flourishing in far-off Australia. There is a likelihood that the descendants of the giant marsupials, once as common here as deer, but that fled from us as the ages rolled away, may become denizens of the very plains these far-off ancestors ranged over at will, but left no trace save a few fossil bones to be unearthed in our own times. Now the curious animals will be side by side with the horse, sheep, and cow, instead of the ferocious reptiles their co-mates in those myriads of years ago.

A NUMBER of capitalists of Seattle and Minneapolis contemplate the building of an immense flume or tunnel from Lake Washington to the shores of Seattle Harbor for the purpose of furnishing water power for manufacturing purposes. The level of Lake Washington is nearly twenty feet above that of the bay at high tide, and the plan, as proposed at present, gives eighteen feet of fall, which is sufficient for all purposes, as it is proposed to put in a tunnel large enough to carry water in sufficient quantities for the needs of the largest factories.