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ESSAY ON POTTERY AND THE FICTILE ART.

HISTORICALLY, CHEMICALLY, AND PRACTICALLY CONSIDERED.

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N contemplating the beneficence of the Deity, how ought we to admire the rewards which Providence bestows upon healthful industry. The wisest of men has said, "In all labour there is profit;" so that the curse pronounced upon man's original transgression, "By the sweat of thy face shalt thou eat bread," has been transmuted into a blessing.

Labour is the substratum of the world's wealth.

It is that which raises us in the scale of nations, pays the interest of our National Debt, supports our glorious voluntary institutions for sustaining art and science, for healing the sick, and for restoring to society those who have wandered from the paths of virtue and morality.

Labour invigorates the intellect, gives to science its discoveries, and opens up to us the hidden sources of Geology and Chemistry, brings near the far distant objects of Astronomy, magnifies the minutest glories of his creative power, and enables the master-mind of man to superintend the systematised factory with all the appliances of science, invention, and practical experience; thus, by division of labour and mechanical power, affording a fair return for capital, and remunerating wages of labour to thousands of male and female operatives,—gratifying both to the patriot and philanthropist, and a blessing to the nation.

Industrial Art produces a demand for agricultural produce; the labour of the mechanic or artisan has a reactive force upon the labour of the plough, the harrow, &c., and thus acting and reacting upon each other, the social condition of the mass is elevated in the enjoyment of nutritive food; often adding thereto the conveniences and even elegancies of life—advantages which, in former ages, were confined almost exclusively to the wealthy.

Among cottage comforts, not the least pleasing to the eye of the philanthropist is a good supply of useful crockery, and if, in the luxuries of the middle classes, we find an improving taste for useful and ornamental earthenware and china, its possession is the gratifying indication of the result of successful industry. Rising higher, among the upper classes we find drawing-room cabinets, mantelpieces and tables decorated with the more costly and beautiful forms of vases, or fictile busts and statuettes; indicating that other various branches of high Art are cultivated in relative proportion, whether in engravings, paintings, or statuary; and that, therefore, the *wooden platter* having been gradually disused by its more cleanly, smooth, and healthful fictile substitute, a great advance is made in the onward progress of civilisation.

Domestic vessels, from the coarse brown pan to the elegancies of the table, utensils for the laboratory, larder, dairy, &c., for sanitary arrangements, with glazed drains, &c., demonstrate the usefulness of the potter's art, and prove that every day the manufacture is becoming of greater national importance, especially as England abounds with clay and coals, the latter being at the very foundation of our social industry, and of far more importance to our prosperity than the gold mines of California or Australia.

On the Continent we find that the elegancies of life have had greater attention than the useful. Foreign manufacturers have been chiefly occupied in supplying china vases, pendules, and lamps, for cabinet or mantelpiece, and, therefore, excel us in that branch of ornament; while the British potter has varied his forms, and studied new and elegant patterns for tea, table, and dessert services, that useful department of luxury of the fictile Art, which has advanced far beyond its Continental competitors. The Exhibition of All Nations in 1851, has afforded other practical illustrations of the stimulating advantages of mutual teaching by competition and rivalry; showing that all may derive improvement not only in their special manufactures, but in general manners, customs, and the higher appreciation of the arts and elegancies of life.

> "These are the gifts of Art, and Art thrives most
> Where Commerce has enriched the busy coast;
> He catches all improvements in his flight,
> Spreads foreign wonders in his country's sight;
> Imports what others have invented well,
> And stirs his own to match them, or excel:
> 'Tis thus, reciprocating each with each,
> Alternately the nations learn and teach."

At present, England admits all foreign china at a nominal duty, but the Continent will not take our glass, china, or earthenware in return, except at a prohibition duty; notwithstanding, English china, especially that covered all over with raised flowers, in imitation of the Dresden, was, a few years since, to be found in almost every china warehouse in the Palais Royal, and other depôts in Paris. Great quantities *of the finer china wares*, I have no doubt, evaded the high duty, and have been smuggled into France. The ordinary table-services of English earthenware, and all useful ornamental domestic articles, are cheaper and of a far superior quality than can be made in France; large French earthenware factories are, however, still kept going by the artificial aid of government protection. It is said that Great Britain has a larger number of skilled workmen than any other nation in Europe, and she still preserves her just fame for high quality, especially in machinery, cutlery, glass, earthenware, china, and many other branches of British manufacture.

For the introduction of novel designs, Paris is the mart of Europe; still, as the advancing intellect of England receives a higher artistic education, through our museums, picture galleries, illustrated publications, and our Schools of Design (which will not fail, ultimately, to impart taste to native talent), there can exist no reason why we should not also successfully compete with our talented neighbours in the *poetry of Industrial Art*.

Under the terms ironstone, stoneware, earthenware, and porcelain, frauds have been constantly practised upon the public, by unfair and disgraceful competitors improperly stamping counterfeit appellations upon the ware. To enlighten the public, and to enable buyers of English fictile manufactures to discriminate, is an act of justice both to the seller and consumer. Clear vibratory sound, silky evenness of surface or glaze (neither too dry, nor too rich (or fat), compactness of the interior, or body (as shown by its fracture and semi-transparency), are the never-failing tests of quality of all descriptions of porcelain.

The terms china or porcelain ought never to be applied to any wares unless they possess the before-mentioned qualities, and a greater or less degree of transparency; all other terms for ware apply to ironstone, earthenware, or opaque fictiles. A ware, therefore, possessing clear sonorous powers, and a rich or fat glaze, with a fine texture of body, and of an equable semi-transparency of hard china or *porcelain* (*dur*), is entitled to the highest rank in this useful and interesting branch of chemical and mechanical Art.

The Chinese, German, Dresden, Berlin, French, especially Sèvres, and also many English productions, have attained a superiority of quality scarcely to be surpassed; it must, however, be admitted that the foreign hard transparent china is in durability much superior to the English, but to a certain extent this hardness is attained by sacrificing other advantages, such as variety of forms and capability of colouring.

Opaque English ironstone may also be termed hard china, and is quite as compact as any foreign; but it has no transparency, and therefore must be ranked in the second order of merit.

There are numerous terms indicating superior quality marked on earthenwares of an ordinary character, used as decoys; they are more or less soft, and however beautiful the surface or colour of the glaze may appear, are only entitled to the third rank of merit, being wholly opaque and more or less liable to craze, somewhat like old cracked china.

The last or fourth class of wares termed dry bodies, are those having no glaze whatever, or very slightly glazed, and semi-transparent in the body, as unglazed jugs, mortars and pestles, also opaque stoneware, as made at Vauxhall and Lambeth, first introduced by Wedgewood.

The Chinese were the originators of hard china, and, so far as the ware is concerned, the moderns have not materially excelled them, but in the beauty of European outline, or in the ornamentation, we are far in advance of that extraordinary, but stereotyped finality nation.

The materials composing the glaze and body of chinaware were for ages kept a profound mystery, but through Father Francis Xavier d'Entrecole, a Jesuit, and Baron de Botticher, an alchemist, the discovery was made; the account of the latter it may not be uninteresting briefly to detail.

Baron de Botticher was originally a druggist's assistant, subsequently the confidant of a celebrated alchemist, who dying, he became possessed of his papers. The King of Saxony, hearing of his fame, enticed and confined him in his castle of Albrechstein in the year 1817, where at this moment the celebrated works at Meissent are carried on by the King of Saxony, and where the Baron was for years incarcerated, in the vain expectation of transmuting the baser metals into gold. He effected what was of superior value to Dresden; he succeeded in finding mineral materials for white hard china (clay and glaze), and manufactured specimens of porcelain crucibles, that ultimately caused large china-works to be founded, producing a quality equal in hardness, and possessing all the essentials of, Nankin porcelain, and which ultimately found its way to Berlin, France, and England, where factories were soon after established.

As all grades of china and earthenware depend for their durability upon the character and extent of their vitrification, much of the success of the potter depends upon the glaze and body harmonising with each other. Under the intensity of the required caloric, a heat that would fuse and refine glass, and in some instances much greater, as the glaze has a tendency to expand and the body to contract, no small skill is necessary to prevent fracture and a liability to craze, (a separation of the glaze from the body in irregular small fissures).

Glass is a complete vitrification; the fictile wares are incomplete vitrifications, for were the caloric pushed to its utmost intensity and duration, both the body and glaze of china would be nearly as perfectly vitrified as glass.

China is much more highly vitrified than earthenware; the advantages of china for domestic purposes, are, economy, cleanliness, and capability of resisting sudden heat and cold without fracture: and in these respects it is superior to glass (which cannot be annealed so permanently as china). Glazed common earthenware can be afforded much cheaper than glass, for pipes, sanitary purposes, &c.

Hard china may be known by its vitrified or polished fracture; the glaze, as it were, penetrating entirely through the body. The fracture of soft china shows a somewhat dry

porous body in the centre of two layers or surfaces of glass, and earthenware has a still more decided dryness in the body and glassy covering for the glaze. Hard china requires to be slightly fired in the bisquit kiln, and hard-fired in the glaze kiln, so that the glaze penetrates through the body. Soft china, on the contrary, is severely fired in the bisquit, and the slight firing which the glaze receives prevents its becoming so homogeneous as hard china, and it receives only a mere glass coating upon the body. A common brick has in it the impure materials of soft pottery, being a silicate of alumina, with an excess of the latter, which makes it easy of fusion, and may serve as an illustration for soft china or earthenware.

A fire brick is the same chemically but with an excess of silica, and is hardware, or China, as compared with the common brick. It is also of much greater specific gravity.

The history of ancient pottery may be said to be both sacred and profane. The Scriptures, Old and New, have many illustrations and similes drawn from the potter and his art, expressive of facility of execution, and the fragile nature of burnt clay vessels; thus, in illustration of the power of the Deity, the prophet says, "And he shall come upon princes as the potter treadeth clay." (Isaiah xli. 25.) Again, in censuring man's resistance to his Creator, "Shall the clay say to him that fashioneth it, What makest thou?" (Isaiah xiv. 9.) "Hath not the potter power over the clay?" (Romans ix. 29.) Also in the sublime exhibition of God's power and punishment: "Thou shalt dash them in pieces like a potter's vessel." (Psalm, ii.)

The Egyptians were known, at a very early period, to have practised this art; especially in the execution of statuette mummies and effigies of their deities, many of which have been exhumed from the tombs of Thebes and other places.

The Greeks, in their vases and pateræ, have conveyed to us materials of high artistic execution, both of ware and colouring: and the British and foreign museums have large collections of these splendid reminiscences of former luxury and Fine Art.

The Etruscans also afford convincing proofs that the pottery of the inhabitants in the vicinity of Vesuvius—whose crater poured forth its liquid fire and destroyed a whole city, the exhumation of whose tasteful treasures are now decorating our museums with elegant vases of originality, beauty of form, and occasionally accuracy of execution—can scarcely be excelled by modern Art, although executed above two thousand years ago. Similar to these are some that our countryman, the persevering traveller Layard, has exhumed and placed in the British Museum, among which are pateræ with exquisite interior decoration. These are the foundation of all true classic taste and design for outlines of vases, &c.; and, it is said, were suggested by conic sections.

France and Europe are much indebted to Reaumur, who porcelainised glass by firing it with gypsum. In 1739, he found similar minerals, in quarries near Limoges, to the kaolin and petunse of China; which enabled him, as Botticher had done, to imitate and even excel the admired Oriental productions. This amiable, intelligent, and patriotic philosopher devoted the greater portion of a long life, at St. Cloud, to making analyses of every description of china-ware. After much labour and numerous disappointments, his reasonings were fully demonstrated, and the following were the results:—

That when a substance is fusible at a known temperature *per se*, as he found petunse, and mixed with another known substance, *per se infusible at any temperature*, as he found kaolin—the fused result will be a vitrified chemical durable compound, like all hard china, and similar to the body of Japan or Chinese porcelain, such as was used for the celebrated Chinese pagoda, 300 feet high, with nine stories, erected 400 years since, at Nankin, and which still shows no signs of decay or decomposition. These experiments suggested in 1739, the French hard china; the announcement was made in the Academy of Sciences of Paris, ten years after the death of Botticher, and was the cause of the establishment (under royal authority) of the celebrated Sèvres manufactory. Then rapidly followed the china-works of St. Cloud, Fauxbourg St. Antoine, Paris, Chantilly, Villeroi, and Orleans; also Naples, Florence, Vienna, Frankenthal, and Berlin.

Dr. Sherrard visited Paris soon after, and brought the Royal Society of London specimens of the native minerals, and of the prepared petunse and kaolin.

Notwithstandiug the great fame of the Continental china, England soon after began to make superior soft china at Chelsea, Derby (both since discontinued), Worcester, Coalport, Stoke-upon-Trent, and other parts of the Staffordshire potteries, which were highly meritorious in execution, in all the ornamental and useful departments of the art; it is, however, far inferior in hardness, although probably equal in nearly all other qualifications to the best of the Continental china; nor has England, in her recent use of the decomposed granite, which gives two substances of the same nature, as petunse and kaolin, advanced her porcelain to the position of hard china—not, probably, because she is unable to do so, but because she has substantial reasons of a manufacturing and commercial nature for doing otherwise.

Hard china, with every caution in the firing, through the intensity of the heat of the furnace, is liable to get out of shape and become otherwise defaced by specks, dry edges, &c., so much so, that in Paris, white china has no less than four choices or qualities. Such is its great liability to get out of form, that French manufacturers seldom resort to novel or fancy forms for tea, table or dessert china, &c.; so that for the last fifty years the same oval dishes and ancient cups and saucers continue to be manufactured; while in England the forms of cups and saucers, tureens, ewers, and basins, and other useful ware are constantly occupying the inventive powers of manufacturers and modellers for novelty, which the inferior intensity of the heats of their china-kilns enables them to accomplish—(overhanging or fancy forms not being liable by intense heats to drop or become misshaped or defaced): therefore except some untoward accident occur, nearly the whole contents of a kiln are successfully fired, and can be sold with fewer imperfections and at considerably less prices than the hard china. Extremes should be avoided, excessive hardness involves waste and becomes costly; on the other hand, china too soft or tender would be injurious; British manufacturers have succeeded in attaining the desideratum of giving a pleasing surface and colour, and moderate hardness of glaze and body, which with fair usage will last as long as fashion or the usual term of human life can render it desirable, and at a reasonable price.

The ancient Sèvres *porcelain tendre* is still highly prized, but perhaps from being too soft was discontinued. If France were in equitable free trade competition with England (by reducing her import duties on china), it is highly probable that she would be driven by motives of economy to the English system of making a china hard enough to stand the friction of fair usage, with a glaze not liable to craze, and of a lightness and capability of accuracy of form which give English potters great control over the success of fancy forms, and which experience has shown cannot be obtained in hard china.

Sir George Staunton, who accompanied Lord Macartney on his embassy to China in 1797, observed on his journey to Canton several excavations caused by extracting from the sides of the adjoining hills the petunse so useful in the manufacture of porcelain, which he thus describes:—"This material is a species of fine granite, or compound of quartz felspar and mica, in which the quartz seems to bear the largest proportion. It appears, from several experiments, that it is the same as the *growan* stone of the Cornish mines. The micaceous parts in some of this granite (from both countries) often contains some particles of iron, in which case it will not answer the potter's purpose. This material can be calcined and ground much finer by the improved mills of England, than by the very imperfect machinery of the Chinese, and at a cheaper rate than the prepared petunse of their own country, notwithstanding the cheapness of labour there. The kaolin, or principal matter mixed with the petunse, is the growan clay, also of the Cornish mines. The *whashe* of the Chinese is the English soap-rock, and the *shekan* is asserted to be gypsum. It was related by a Chinese manufacturer of that article, that the asbestos, or incombustible fossil stone, entered also into the composition of porcelain."

A village or unwalled town, called Rüitchin, was not very far distant from the traveller's route, in which three thousand furnaces for baking porcelain were said to be lighted at one time, which gave to the place at night the appearance of being on fire. The genius or spirit of that element is, indeed, the principal deity worshipped there. The manufacture of hard porcelain is said to be precarious, from the want of some precise method of ascertaining and regulating the intensity of the heat within the furnaces, in consequence of which their whole contents are sometimes baked into one solid and useless mass.

Whatever claims other nations may assume to priority of invention, as regards common pottery, the Chinese have, undoubtedly, the merit of being the originators of hard porcelain.

The unglazed wares, called dry bodies, should be placed in the fourth class, and may be termed terra-cotta. The following is extracted from the *Art-Journal* of December, 1847.

"The term terra-cotta simply signifies burnt clay, and may thus be appropriately applied to the most ancient objects connected with the plastic arts, such as cups and sepulchral urns. The materials of these, in many instances, being nothing more than pure clay baked in an oven; yet the makers appear to have exercised as much skill and ingenuity in the formation, as if they were working in marble or metal, producing articles destined to last for ever; so that, in no instance, is the taste of the ancients displayed to greater advantage than in the efforts of the potter. The perfection of these specimens of antique art may, perhaps, be attributed in a considerable degree, to the nature of the material of which they are composed; its pliability enabling the workman to mould his work to any form, as well as permitting him to remould it or retouch it by the addition of fresh clay, till he was satisfied of its entire correctness. This capability of alteration has been beautifully referred to by the prophet Jeremiah, 'Then I went down to the potter's house, and, behold, he wrought a work on the wheels, and the vessel he made of clay was marred in the hands of the potter, so he made it again another vessel, as seemed good to the potter to make it.'"

The ancient Britons, Anglo-Saxons, aboriginal Indians, as well as the Jewish nations, Phœnicians, Egyptians, Grecians, and Romans, have all possessed their terra-cotta, or more highly finished unglazed and occasionally glazed pottery, and knew well how to turn it upon the wheel (as now practised at the Vauxhall or Lambeth potteries), exactly upon the principle of the machinery described (and as the glass-makers to this day knead clay used for their pots or crucibles) by the prophet Isaiah. Quoting again from the writer in the *Art-Journal*, he says:—"Undoubtedly the potter's art was carried to a great perfection by the Egyptians, many of whose designs appear not only in the particular objects themselves, but are of frequent occurrence on their monuments. In making the pottery, some of the vessels were unavoidably broken in their passage to and from the furnace, and such as were unsound would crack when exposed to extreme heat; hence heaps of pieces were accumulated about the furnaces, which afforded shelter to numerous reptiles. 'Though ye have lien among the pots,' is a phrase still used in the east to denote a state of degradation."

The most artistic designs and the greatest variety of models in common burnt clay are those recently executed in France, generally known by the name of Beauvais ware. The German lava ware, in that department of pottery, also shows considerable advance. Although the designs are not so pleasing, the fineness of the clay and execution are far superior to the French.

The Romans established their art of pottery in the countries which submitted to their government, and Britain acquired a knowledge of the ceramic art from their conquerors. There were discovered at Castor, Northamptonshire, two Roman kilns, viz. one for bisquit and the other for glaze, somewhat of a conical form, four to five feet diameter, with seggars and vessel wares, &c., in the last stage of manufacture; many similar discoveries elsewhere in England have been reported in various archæological periodicals. Some Roman specimens of a red colour, in the possession of Mr. Roach Smith, are beautifully embossed in animals and borders, of dry body very much resembling the ancient Chinese decorations and ware on teapots, many of which are wrought with figure patterns, but others in flowers and running designs artistically embossed and highly finished. Ancient India and Japan had also their share of merit in this character of pottery; some ornamental foliage growing out of the stem and root, forming a flower-vase, suggests an advancement in design and execution, to which, but for the actual specimens handed down to us, we should (from the paucity of history on the subject) be indisposed to give credence; and it is not improbable that the Chinese and Indians were unaware of each other's productions, although their taste and necessities led to similar inventions and a resemblance in style, simultaneously.

Statistics of the Staffordshire potteries become daily more interesting. The Staffordshire potteries, the principal seat of the pottery trade, comprise parts of several parishes, and extend in the whole length a distance of eight miles, consisting of Stoke, Burslem, Lane End, Etruria, Tunstal, Hanley, Shelton, &c. The two latter are as one town, and are the most populous; taking all the townships of the Potteries as one population of artisans engaged in china and earthenware manufacturing, including also Tunstal, Lane End, Stoke-upon-Trent, &c., the total would probably be 50,000 of men, women, and children, employed at the rate of 10*s.* to 15*s.* per week on the average, requiring an annual payment of above 1,500,000*l.* for wages alone, better wages perhaps than any other staple trade of Great Britain. Supposing therefore that the whole kingdom should add another 20,000 population of potters, the entire annual wages would not fall far short of 2,500,000*l.* sterling. Probably two hundred pounds weight of pure gold are annually consumed for gilding china, scarcely any of which returns again into the melting-pot, when once it has been dissolved for china decoration.

A digression may be pardoned to show the evils of strikes of workmen. In fourteen factories only, in the Staffordshire potteries, on the strike in 1836, 3500 men, women, and children, were thrown out of employ, which, with a proportion of colliers, crate-makers, &c., incurred a loss in ten weeks of 31,168*l.*; and at sixty-four other manufactories in ten weeks, ending Jan. 30, 1837, the number of hands out of work was 15,660, incurring a loss in wages to potters, engravers, painters, colliers, &c., of 157,442*l.*

Making the total loss to operative potters	£152,816
Colliers, crate-makers, and engravers	19,332
To the manufacturer	16,462
Total	£188,610

Porcelain clay, or kaolin, is found in primitive rocks, among granite in Cornwall. Constituents of kaolin are—

Silica	52
Alumina	47
Oxide of Iron	0·33
	99·33

Some clays shrink one-twelfth in the drying and firing; those shrink least that have most silica. China clay of Devonshire contains sixty parts of alumina, twenty of silica. Felspar or petunse constituents are

Silica	62·83
Alumina	17·02
Lime	3·00
Potash	13·00
Oxide of Iron	1·00
	96.85

China clay, or kaolin, and felspar, or petunse, are both the proceeds of decomposed granite, and the chief materials for the manufacture of china. Felspar is fusible, and with sufficient heat will make an opalised glass.

Flint is silica in a state nearly approaching to purity; viz.,

Silica	90
Lime	0·50

If two pieces are rubbed together sharply, light is produced; they give phosphorescent light by slight friction in the dark, and emit a peculiar smell. Yellow spots on flint are indicative of iron. Flint is burnt calcined, and ground in water between mill-stones. Flint cannot be fused by an ordinary furnace without the addition of an alkali, or metallic substance.

Clay is a silicate of alumina, and varies in the proportions of its constituents; that which contains most alumina, is most readily fused. Clays have a peculiar smell, called argillaceous; they are opaque, and non-crystallisable. Clays absorb water with tenacity, and make a strong paste, which, dried and fired, hardens, so as to strike fire with steel. The odour of clay is said to be from iron; pure clay having no smell.

Granite decomposed by the caloric of nature, leaves its residuum, petunse and kaolin; the former being principally silica and infusible, *per se*, and the latter, kaolin, being composed of alumina and potash, and fusible; the chemical constituents being well ascertained, the potter may avail himself of any form of silica, ground flints, or fritted sand, or any alkaline or other chemical product that will answer for kaolin. The potters, therefore, avail themselves of the following materials :—

Cornwall Stone, a substitute for petunse and kaolin.
Flint, or kaolin.
White lead.
Cullet, or broken flint-glass, for common glazes, but lately much disused.
Soda.
Potash.
Arsenic.
Nitre.
Borax.
Oxide of Tin.
Manganese.
China clay, or kaolin.
Carbonate Barytes.
Gypsum.

Clay is thrown into a tub, having in its centre an upright shaft, with cutting knives fixed to it, and the tub being of a conical form, the widest end upwards, the clay is forced down to the smallest end, from one knife to another, thus being constantly cut and pressed, till forced out of a hole at the bottom. When it has been thrown several times into this mill and worked through, it will be fit for use. The old plan of mixing clay, still used in China and elsewhere, is by treading with human feet. The lumps of clay so prepared are put into a vat containing water, also with an upright shaft worked by machinery, and revolving and agitating like a cylindrical butter churn, so as intimately to mix the clay with the water, to make a sort of pulp or slip. Dilution of clay is considered of a proper consistency, when a pint of it weighs 24 oz. The flints are placed into a sort of lime-kiln, and burnt, and, while hot, thrown into cold water, when they become cracked, and are easily broken into small pieces for grinding in a mill, of an ingenious nature, worked by steam power, made of Chert stones, one stone grinding upon another in water, reducing the flints to an impalpable powder; 24 oz. of slip flint is also the right specific gravity for the flint mixture with water, to make slip of the right consistency for mixing with the clay slip in suitable proportions. The fluid mixture of clay and flint is then passed through sieves, and pumped into the slip kiln. The slip kiln is a sort of long trough of firebrick, fifty to sixty feet long, with heated flues passing under its whole extent, for evaporating the water; occasionally the contents must be turned over and agitated, to keep the flint, which is heavier than clay, from sinking and hardening the bottom of the mass.

The proportions of clay and flints are usually secrets; perhaps an average of 1 flint to 3 clay is about the quantity. The clay or paste thus tempered and prepared undergoes the further process of slapping. If done by the hand, which was formerly the only mode, a mass of fifty or sixty pounds weight must be placed upon a slab, frequently cut through and through with a wire, and as often hurled one mass upon the other with all the strength that a powerful man can exert, so that, at the commencement, if two pieces of clay were differing in colour, the work will not be considered finished until all air-bubbles are excluded, and the aggregate mass appears of one homogeneous tint and texture. Machinery for slapping or *blunging*, of the same nature as the pug-mill, with revolving, cutting, and pressing knives, as formerly described, now supersedes hand slapping. Flint and gypsum, and old, broken, ground china, are generally mixed with the china clay, or kaolin, of France, for glazes. It is said that at Limoges, in France, where the best clay is found, the mixture for china body may be bought ready mixed and fit for use at about three halfpence per pound, English money, a great advantage to small manufacturers.

The Colebrookdale china is extremely durable, and harder than many English chinas, but not so hard as the French, Berlin, or Chinese. Its glaze is composed of—

27 parts of ground felspar,
18 parts of borax (borate of potash),
4 parts of Lyme sand ground,
3 parts of soda,
3 parts of china Cornwall clay.

This mixture, fritted or melted together, and ground to an impalpable powder, is then made into a slip by mixing it with water, to the specific gravity of 24 oz. to an imperial pint.

The mixtures for earthenware glazes are endless in variety. One for cream colour, and another for blue, printed, will suffice.

Ground Cornwall stone, or petunse		23 parts.
Cream colour	Flint	12 „
	Broken flint glass	17 „
	White lead	48 „

Another glaze, for blue printed ware—

Cornwall stone	25 parts.
Carb. lime	3 „
Flint	10 „
Litharge	46 „
Borax	16 „

The glaze used at Sèvres is almost exclusively composed of felspar. The following glaze is said to be used in some parts of France for hard china.

French Glaze.

Ground flints	11 parts.
Ground porcelain	8 „
Crystal of calcined gypsum	12 „

The proper proportions for glaze must be studied and harmonised with the body, or crazing will be the result.

The meritorious enthusiast, Bernard de Palissy, is said to have made immense improvements, although a draftsman and surveyor in France in the reign of Henry III., in this branch of his art. The reproaches of his wife and family for his so frequently demolishing and rebuilding his furnace, and using part of his furniture owing to the want of money to procure fuel, he outwardly bore with cheerful countenance, although his mind was full of bitterness and disappointment, and ultimately his undaunted perseverance was rewarded with amazing success. He became eminent as a lecturer in the sciences, as a wealthy manufacturer, and was for France in the renaissance ages what Wedgwood was for England in modern times, the father of the pottery of high Art.

He was a Protestant, and too liberal to keep his sentiments to himself; and some of his facts telling against the dogmas and frauds of the priests, he was dragged to prison and died therein.

He had an interview with Henry III.—"My good man," said the King, "if you cannot conform yourself in the matter of religion, I shall be compelled to leave you in the hands of my enemies."—"I am already willing to surrender my life, and could any regret have accompanied the action, it must assuredly have vanished upon hearing the great King of France say 'I am compelled.' This, sire, is a condition to which those who force you to act contrary to your own good disposition can never reduce me, because I am prepared for death, and because your whole

people have not the power to compel a simple potter to bend his knee before images which he has made."

It is said the Chinese calcine a sort of agate, which no doubt contains a large portion of silica, to every 1 oz. of which, 2 oz. of lead are added and mixed together for making a varnish or covering, which adds to the natural whiteness of the bisquit. It is this peculiar glaze that is stated to be used for the crackled china; probably the separation of the glaze into crystallised irregular forms with fissures between may be caused by the ground calcined agate glaze not being sufficiently mixed with its solvent, the lead, or alkali causing irregular thicknesses of glaze, which, annealing badly, contract irregularly, and in a greater proportion than the bisquit body, and thus produce the cracked effect. So highly valued was the white porcelain of China, that it was dignified by the name of Precious Jewel of Jao Tcheou.

Good glazes are essential to perfect China or pottery (with the exception of garden pots, water-coolers for India, wine-coolers and a few vessels for ordinary use); ware without glaze would be comparatively useless, as its rough porous surface would harbour dirt, and be more disagreeable for table use than the old wooden platter.

Common salt or chloride of soda is the simplest and cheapest glaze, as it is thrown into the upper part of the kiln when the ware is at a certain degree of temperature, so that the saline vapour not only glazes the surface but penetrates into the body. This vapour glaze is chiefly used for common stoneware fired without seggars.

Dip glazes may be simple or compound; alkaline being the simple, fritted with silex; metallic substance mixed with the above, being the compound.

Flint glass is often used as a glaze in combination with alkalies and other chemical substances, and will therefore class among the compound glazes.

The felspar glaze (kaolin) would rank among the simple, the constituents being silicate of potash and alumina, a natural production; the lime and oxide of iron being in such small quantities. The constituents are—

Silica	66
Alumina	18
Lime	1
Potash	12
Oxide of iron	1
Rose's analysis	98

The real hard glazes of China, Japan, Berlin, Dresden, and Sèvres, are chiefly, if not wholly, of felspar calcined and ground to an impalpable powder; for soft porcelain glazes, every manufacturer has his own secret mixture; the following will serve as compound specimen of glazes—

Cornwall stone, or grawn (kaolin)	20 parts
Flint	10 „
Cullet	40 „
Red lead	14 „
Nitre	6 „

Cornwall grawn	23 parts
Flint	12 „
Cullet	17 „
White lead	48 „

Grawn	25 „
Carbonate of lime	3 „
Flint	10 „
Litharge	46 „
Borax	16 „

The above materials are sometimes fritted separately, and ultimately mixed together before grinding.

The peculiar effect of what is called the flowing blues is owing to salt being thrown into the bisque kilns during the firing upon the printed ware.

Tinted glazes are used of various colours for blue printed ware, &c.; the glaze is usually tinted of the same colour with a small portion of cobalt.

Smear is a term used by potters for a sort of semi-glaze which is made by adding to earthenware glazes common salt or a carbonate of potash.

Washes for seggars are made of common glazes, with additions of lime, common salt, carbonate of potash, or cheap alkalies.

Dry bodies are a finer sort of terra-cotta for making the following wares:—chemical utensils, stone, jasper, pearl, cane, drab red, black, Egyptian fawn, brown ornaments, vases, &c., and lastly, parian; many of them are so vitreous in bisquit as scarcely to need the use of glaze; they are somewhat transparent and susceptible of nearly as high degree of finish as marble. The late Mr. Wedgewood brought it, particularly the black cane and jasper, to its present degree of perfection. The more modern parian ware is of the same character, but with this essential modification, that it has a better semi-transparency, more like alabaster and marble, and is therefore well suited to statuary figures, busts, &c. The old pearl or china bisque ware is too opaque for imitation of works of Art, usually executed in marble.

The colours of china and earthenware, like glass, are required of a vitrifiable nature, and consequently must be formed of metallic oxides. The treatment, however, varies, as the heat for fixing the colours in china is very much less than is required for making coloured glasses. The following are the chief metallic oxides used with fusible glasses or fluxes, to cause the colours to adhere to the glaze; when used under the glaze, little or no fluxes are necessary.

Blues.—Cobalt, with the oxides of tin and zinc, to give opacity and to vary the tints.
Green.—Oxide of copper, or chromate of copper, for delicate fine green, protoxide of chrome.
Red.—Nitrate of iron; muriate of manganese.
Yellow.—Antimony and chromate of lead.
Black.—Oxide of platinum, or iron in excess, cobalt and manganese.
White.—Arsenic and tin.
Gold.—Is used as precipitated by tin or alkali, from a solution of gold in aqua regia, or acid, or, as it is termed, the Cassius precipitate.

Silver and gold lustres need no burnishing, the metal being mixed with essential oils and fatty matters.

Seggars, in which articles are preserved from the smoke and vapour of the kilns, are made of fire clay, and old ground seggars, and like the glass-makers pots, are equally important in the manufacturing results. They are turned or moulded, and piled one upon another, the upper acting as a cover to the lower. Clay seggars must resist the greatest possible heat, and considerable weight, which, when filled with ware, will be many hundred weight.

Two conditions are necessary in order to establish potteries for earthenware and china, viz., seggar clay and coals, in the same district; and it so happens that the geological structure of the earth is favourable to this association of these materials in alternate layers.

The Staffordshire potteries possess these two desiderata, but draw nearly all the clay for making the ware either from Devonshire or Cornwall, which is conveyed partly by vessel and partly by canal.

As common salt glazed stoneware needs no seggars, large quantities are made in London and its vicinity.

The processes of manipulation in pottery are extremely simple, viz.: moulding and casting, throwing and turning. Plaster of Paris is found the cheapest and best material for making moulds. It is merely mixed in cold water and dropped upon the wax or clay model, the facing being about the consistency of cream; the thickening the mould, for purposes of strength, may be of a coarser plaster, and of greater consistency. The whole mass soon sets without the least possible shrinkage, and relieves from the original die or model with sharpness and exactitude of surface; and when slightly baked, will produce forty or fifty articles, when the mould becomes useless. Plastic clay, however yielding in its nature, by repeated pressure, ultimately blunts the sharpest lines of the plaster mould.

Permanent moulds of burnt clay, and other porous bodies, have been tried, but partly owing to contraction and other objections, they have been abandoned. Metallic moulds are useless, not being porous, so as to allow the moisture and air of the clay to exude while under severe pressure.

For works of Art the moulds consist of a great many pieces, to allow of undercutting, as it is termed; but for simple articles, as plates and dishes, where there is no undercutting, one mould is sufficient. Hollow oval moulds for tea-pots, tureens, &c., are made in halves.

In the case of hollow vessels, pressed from prepared flatted clay like rolled pie-crust, the surplus is cut off and the two pieces united together by means of slip. Before firing, the articles thus moulded are placed in warm rooms, on shelves, heated by stoves for drying.

Casting teapot-spouts, or small hollow vessels, requires slip, of the consistency of cream, to be poured into the plaster mould, whose porosity hardens the exterior of the slip by suddenly depriving it of its moisture; the remaining fluid portion of the slip is emptied out of the mould, leaving the cast article of the thickness required, which is regulated by the time the slip is kept in the mould. The contraction is greater in casting than pressing, the former is only used under special necessities.

Throwing.—The most ancient potter's disk wheel is that which is placed horizontally and connected with a vertical spindle, the lower part working in a bed of timber, or the floor, and the upper part of the spindle in the timber of the higher portion of frame of the chair on which the workman sits to form the lump of clay into useful hollow forms; the power to produce the rotatory motion is effected by the workman's foot. Connected with the above upright iron shaft and potter's wheel, is the rotatory horizontal table, upon which the lump of clay is thrown, and the workman dipping his hands into water, with considerable tact, which practice only gives, with the hand presses outside, and the thumb at first inside, and afterwards both hands manipulating the crude lump inside and outside, repeatedly dipping his hands into water, and then either with the fingers or a wood or iron sectional tool produces the required vessel; after being gauged by a profile of wood, it is cut off the stand with brass wire and placed in the drying room.

Hand-power, by a boy or a man, has been subsequently applied for turning a vertical wheel of large diameter with a crank handle, which with a catgut or other band placed into a groove of a small wheel creates more power than the foot and a considerably greater velocity, which can be increased or decreased at pleasure, the potter having only to direct the turner accordingly.

In the large and more modern extensive factories where steam power is used, all the throwing power proceeds from double cones with straps working at the larger ends of the cones when a slow motion is used, and at the smaller when greater velocity is necessary, and all connected with the motive power of the engine, as used by Messrs. Wedgewood of Etruria, and Messrs. Copeland of Stoke on Trent. The vessel in a "green" state, when finished by turning, smoothing, &c., may have ornaments of small embossed figures moulded from plaster moulds, and made to adhere to vases or jugs with a slip mixture of the clay, applied with camel hair brushes.

Cups, saucers, &c., or other articles requiring to be lathed, are treated nearly the same as wood turning, being fixed to a chuck and turned or smoothed by iron or steel tools, or milled with small steel milling wheels. A regular gentle pressure should be used so as to make the clay compact, smooth, and of uniform aggregated solidity. The turning lathe may have foot power, hand or steam power, as described in the throwing process.

Ordinary handles for cups and jugs are made in endless lengths by pressure of the piston on the clay through a shaped hole at the bottom of the cylinder and cut in suitable lengths.

Stoneware pipes for conveyance of water are made after the same principle, the prepared clay being forced through an open ring at the bottom of the cylinder by power being applied to the piston above, and cut off in lengths of about two feet, as fast as the downward pressure exudes its cylindrical piping; the socket at one end has afterwards to be added by a moulded piece joined to it while green.

Modelling for potters is like every other manufacture requiring originality. Plastic clay is the usual material, although occasionally wax,

mixed with white lead, and worked with the simplest wood or ivory modelling tools, is used.

Printing.—The greater part of pottery printing is under the glaze, and done by means of a transfer from copper to paper. A copper-plate is engraved, rather deeper than for ordinary printing, and is rubbed only with a varnish, which being again rubbed off, leaves it only in the engraved pattern. The paper is rubbed on the copper-plate, and takes the impression, which is transferred by gentle hand-friction to the bisque plate, and the metallic oxide, say cobalt, is dusted on, and adheres to the varnish lines. The surplus colour is then dusted off by a fine brush or cotton wool. Outside glaze printing is nearly the same as before described, but the medium of transfer is a glue bat, being of a very elastic mixture of the thickness of calf-skin. The same glue bat is used more than once, but the paper transfer can only be used for one impression. An enormous quantity of paper is used in the Staffordshire potteries, chiefly for printing blue table ware. Circular lines of colour or gold are painted upon plates, or cups and saucers, by means of a simple hand-rotating table or stool, which is kept in motion by the left hand, while the right hand holds a camel's hair brush, which, gently pressing it with colour, gives the finest line with the greatest accuracy.

Copper-plate printing by glue bats, or by means of paper, is comparatively a slow process to that of block-printing by raised type, which, by means of a press machine, will take off at least ten times as many impressions in the same time, and with less injury to the raised type, than accrues to the copper-plate sunk engraving. Mons. de St. Amans, a gentleman residing at Agen, in the south of France, has made many improvements in china, and for several years had an official department at the Royal Porcelain Works, at Sèvres, near Paris, to which he gave the benefit of his inventions. This gentleman also introduced into England his improvements on the Bohemian plan of introducing encrusted figures into glass, which was subsequently patented; and recently a commission has been appointed at Agen, and a favourable report has been made of his method of printing colour and gold from projecting stereotype plates, produced by electro-deposit from fac-similes, or, rather, originals in stone, the pattern being produced on the surface exactly similar to lithography.

In the potteries for the ornamentation of useful ware, such as tea-table and dessert services, division of labour is practised to a large extent, by which women and children earn remunerating wages. What are termed Japan patterns, after the Chinese showy style of colouring, are printed simply in outline, or partly shaded inside or outside the china or earthenware glaze, the dark blue being filled in by hand, more generally under the glaze, and all the reds, yellows, and other colours or grounds, being done by hand.

Many interesting details are necessarily omitted that the space allotted to an ordinary essay may not be exceeded, but we cannot conclude without a few words of well merited praise due to the memory of the late Josiah Wedgwood, Esq., one of the greatest of potters, chemists, and revivers of his art, infusing into it a vitality, originality, and perfection of finish. He was not only the founder of the Staffordshire Potteries, but he moulded exhumed ancient vases for reproduction; he employed, without reference to cost, the finest modellers and men of the highest genius, among others the late Flaxman, whose fame is imperishable. His productions were patronised by monarchs, and the whole artistic world acknowledged his unrivalled merit. He emerged from humble origin by self-education, and rose ultimately to fame and fortune, and had the ceramic art continued to progress as he had left it, there would not have been for several years since his decease a protracted stagnation in onward progress, though recent energy has effected a revival in British Fictile Art.

Wedgwood was a philosopher and a gentleman; he died as he had lived, a philanthropist and a Christian. No man so justly deserved a nation's monument, and his ashes ought to repose in the cemetery of princes.

WHAT IS HERALDRY?

OR,

AN ENQUIRY INTO THE ORIGIN AND NATURE OF ARMORIAL ENSIGNS,

IN CONNEXION WITH

HISTORY, BIOGRAPHY, POETRY, AND THE ARTS.

BY WILLIAM PARTRIDGE.*

HAVING traced the origin of armorial bearings from the enriched shields of the great captains of antiquity, and the descriptions of them handed down by tradition and the poets, through the historic periods, until, under the requirements of the feudal system, and the Crusades, they assume, in the middle ages, very nearly their present system of order and method; it may be remarked that, although, with the altered system of warfare, the use of a shield as a defensive weapon among the nations of Christendom has long since passed away, yet its importance as a mark of honourable distinction has in no wise diminished. Besides the perpetuation of family honours in the emblazoned shield, we find from the time of the Maccabees down to the present that an enriched shield has been considered a gift worthy of the greatest princes to bestow and to receive. When the Jewish ambassadors were in treaty with Lucius the Roman consul and with Ptolomy, they sent as a present a shield of gold, of a thousand pounds.† Hence we have also the Napoleon shield, the Wellington shield, and many others. There is now preserved in the guardroom at Windsor Castle an elaborate shield, which was presented to King Henry VIII., by Francis I., at the Field of the Cloth of Gold. It is the work of Benvenuto Cellini, and represents the life of Julius Cæsar, exquisitely wrought in Damascene work, in steel, silver, and gold, and is a most admirable specimen of art by that accomplished Italian.

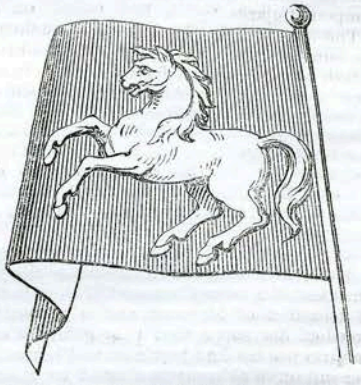
But still more recently, the King of Prussia having stood sponsor to the heir to the English throne, resolved to commemorate the baptism of the Prince of Wales, by a suitable present, and none more appropriate than an enriched shield. On his return to Berlin therefore the King gave a commission to Director Peter Von Cornelius, and to the first Privy Architectural Counsellor, Stüler, to prepare the work. It was modelled by the sculptor August Fisher, cast in metal, chased by August Merteus, and the figures cut in onyx by T. Calandrelli. The goldsmith's, enameller's, and carved works were completed by G. Hossauer, goldsmith to the court, and it was finished on the 18th of January, 1847. This magnificent shield, chased in silver and in the highest style of Art, and enriched with gold and gems, is now in her Majesty's possession, and was shown in the Great Exhibition in 1851, very near to the famed Koh-i-noor.

After the shield, the most important feature in Heraldry is the banner. By a banner we understand a piece of drapery, or other object, elevated on a pole, and carried aloft in the battle-field, and either with or without a device upon it; and all the various terms of Flag, Standard, Banner, Colour, Ensign, Pendant, Streamer, Banneroll, Pennon, Pennoncell, &c., are only technical variations of the same thing. But the general terms, Banner, Standard, and Ensign, comprise all that belongs to the subject in History, or Scripture, or Poetry.

Banners have been in use from the earliest ages. Xenophon gives us the Persian standard as a golden eagle, mounted on a pole or a spear; and the well known eagle of Rome has been already noticed. We find banners very early in use among the nations of Europe. In this country the introduction of banners was clearly of a religious origin. Venerable Bede says, that when St. Augustin and his companions came to preach Christianity in Britain in the latter part of the sixth century, and having converted Ethelbert, the Bretwalda of the Anglo Saxons, (his Queen Bertha had already embraced the Christian faith,) the monk and his followers entered Canterbury in procession, chanting, "We beseech thee O Lord, of thy mercy, let thy wrath and anger be turned away from this city, and from thy Holy Place, for we have sinned, Hallelujah;" and they carried in their hands little banners on which were depicted crosses. The missionaries were allowed to settle in the Isle of Thanet, and Canterbury became the first Christian church.

From this time religious houses arose in various parts of the kingdom, each of which had its banners in honour of its especial patron saint. Thus the monastery of Ripon had the banner of St. Wilifred. The Monastery of Beverly had that of St. John. Both these banners were displayed in the great fight at North Allerton, in the reign of Stephen, between the forces of King Stephen, commanded by Thurston, Archbishop of York, and those of David, first King of Scotland; and such was the struggle made for the possession of the banners, that this fight was called the "Battle of the Standard." The monastery of Durham had also a very rich banner, made in 1346, and dedicated to St. Cuthbert, and when this banner was brought out in an insurrection, called the "Pilgrimage of Grace," Wilfred Holme very quaintly says, "Saint Cuthbert's banner did cause the foe to flee."

Sir Francis Palgrave has brought forward excellent reasons for believing that the names Hengist and Horsa, who were invited by Vortigern to settle in Britain, were not the personal names of these Saxon chiefs, as proper names were then by no means fixed, but that the terms are equivalent in the old Danish tongue to a stallion or a horse, and that it most probably expressed the device on the banner which these sea rovers carried at their mast-head. A strong corroboration of this opinion is the fact, that from their settlement in Britain, the snow-white steed became the ensign of the kingdom of Kent, and is to this



BANNER OF THE WHITE HORSE OF SAXONY.

day of the county of Kent, and was the ensign of the old Saxons of Germany, before they came here in the year 449. It still forms an integral portion of the shield of Brunswick Hanover, and of the Order of the Guelph, and is most probably the oldest authentic heraldic ensign known in this country.

The raven has been regarded from very early ages as an emblem of God's Providence, no doubt from the record in Holy Writ of its being employed to feed Elijah the Prophet, in his seclusion by the brook Cherith; and it was the well-known ensign of the Danes, at the time of their dominion in this country. In the year 742, a great battle was fought at Burford, in Oxfordshire, and the Golden Dragon, the standard of Wessex, was victorious over Ethelbald, the King of Mercia. The banners of several of the Saxon Kings were held in great veneration, especially those of Edmund the Martyr, and of Edward the Confessor. The latter king displayed the ensign here given;—a cross flory between five martlets gold, on a blue field, and which may still be seen on a very ancient shield in the south isle of Westminster Abbey. When William the Norman set out to invade England he had his own ensign, the two lions of Normandy, depicted on the sails of his ships; but on the vessel in which he himself sailed, besides some choice

* Continued from p. 5.

† 1 Maccabees, chap. xv.