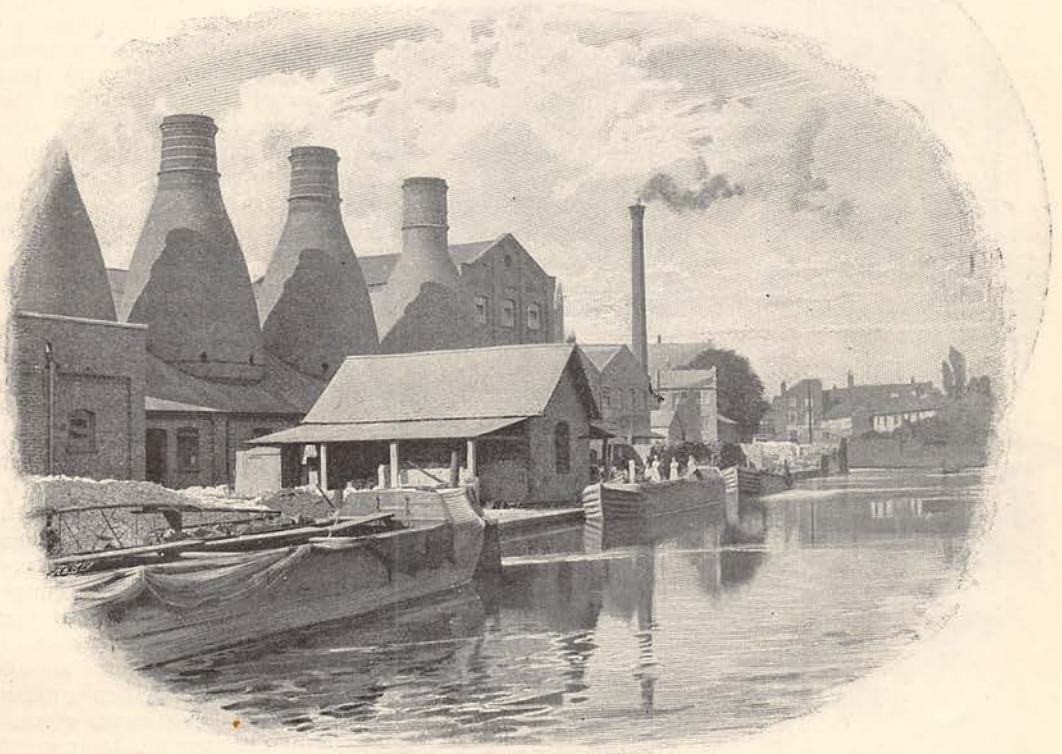


PORCELAIN : HOW IT IS MADE.

BY MARY SPENCER WARREN.



PART OF THE EXTERIOR OF THE ROYAL PORCELAIN WORKS, WORCESTER.



NE of the most interesting British manufactories it is possible to visit is that of a porcelain firm, so numerous, varied, interesting, and artistic are the processes. The oldest, and for beauty of production the most cele-

brated in England is the one known as the Royal Porcelain Works, Worcester. Nearly one hundred and fifty years ago it was founded by Dr. Wall, an artist, a physician, a chemist, and a university man of much celebrity. I need scarcely remind the average reader that the potter's art is very antique. We have drawings of various processes which date back nearly four thousand years—taken from tombs of the ancients, and evidence of beautiful work by the early Chinese, Japanese, and Romans. Mention of it is made in the Bible continually, the most explicit being in the eighteenth chapter of Jeremiah. The art, in fact, has been assiduously pursued at all periods of

the world's existence, flourishing exceedingly in the Middle Ages in Holland and France (with which later country the name of Palissy is indissolubly connected), and being brought to much perfection in Saxony and Italy.

Ancient pottery, as a study, is an extremely interesting one; and one celebrated writer graphically describes "the sensitive clay in the hands of the potter, exhibiting the most subtle expression of the actor's will, and presenting to us the mind and character of ancient peoples who have left no other trace behind."

Fascinating as this study may be, however, it is with the modern manufacture I now purpose dealing; and therefore, ask and obtain permission of the managing directors of the works I have already named, securing thereby an intellectual treat, an insight into the process from beginning to end, and a certain knowledge of materials used in the art. Such I will now endeavour to make my readers acquainted with.

The special production of these works is



THE POTTER'S WHEEL.

vitreous and ivory porcelain, the latter celebrated throughout the world; also there is the fine porcelain, terra-cotta, majolica, etc. The decorations are modelled and coloured golds, enamels, Oriental Renaissance, perforated, Raphaellesque, jewelled bronze, etc.

The Royal Porcelain Works are situated in close proximity to the picturesque old Cathedral, and occupy a large space of ground. Very little of the old building is left, the greater portion of what is seen having been erected since 1840, and the present company having very considerably enlarged and improved the premises. The photograph at the head of this paper shows only a portion of the works; no entire view can be obtained except from the summit of the Cathedral tower, and the great height of this of necessity dwarfs the size. Here you will notice the river, by means of which much of the material used is carried to the works; then some sheds backed by a portion of the works, and what would be to the uninitiated a series of queer-looking chimneys, but that are in reality kilns, the purpose of

which I shall presently explain.

The principal entrance is *via* some massive gates and across a large courtyard, which brings one direct into the handsome show-rooms. Most beautiful are the specimens here displayed, but there is no time for more than a casual glance: I hurry on to witness the actual process of making, commencing with the mill. Here may be seen the materials used for composition, these consisting of china stone and china clay from Cornwall, fire-clay from Broseley and Stourbridge, felspar from Sweden, marl and flint from Broseley and Dieppe, and calcined bones, both English and American. Chemicals are, of course, an important item. Thus it will be seen that no local material is used, nearly everything having to be brought long distances, even from South American ranches.

A brief glance at the engine-house, then upstairs to two departments wherein may be seen the large grinding pans at work; these, which thoroughly grind and mix every substance used,

are lined with hard stone, and have an upright shaft in the centre with radiating arms moving the runners or grinding stones. The materials are placed in these pans together with some cold water, the mill is then started, and kept running until every particle is reduced to the substance of thick cream. I may add that while some materials are ground in twelve hours, others take as much as six days. It is finally all put through a sieve of silk lawn, with about four thousand meshes to the square inch. This will give some idea of the great fineness which has to be obtained. The pans for preparing glaze are of just the same formation, the glaze being made from lead, stone, borax, etc.; these, however, are first put in a frit kiln, where they melt and emerge looking like solid pieces of glass; these then run direct into water and are ground, often taking ten days to secure the necessary finish.

In the clay shed may be seen a large amount of pulverised clay. Then comes the mixing or slip house; here the mixing pots receive from

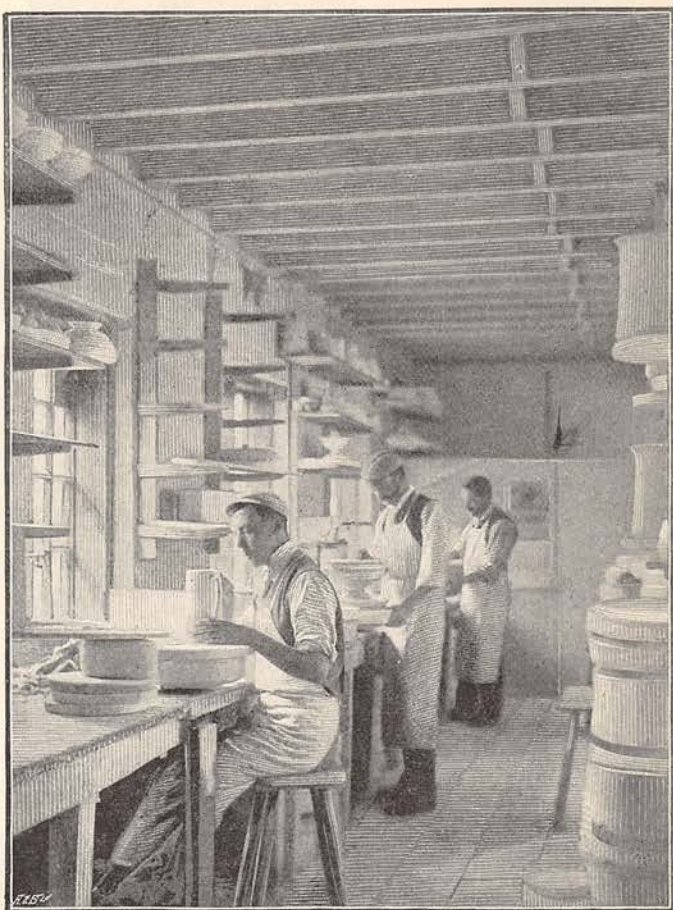
pumps the ground materials, which from the vats pass through machine-worked sieves. It is then pumped into the press, this being formed of a number of separate chambers, linen-lined; hydraulic pressure is brought to bear, which forces out the water, and leaves a paste of thick consistency. This is then put into a vault, where it is frequently beaten and turned about much as a baker treats dough.

Our second illustration shows the potter's wheel, used more especially for vases, cups, and bowls. This is the oldest mechanical contrivance used in the potter's art, and is a most fascinating performance; the clay is so plastic that cups and vases are formed before you can look round. The thrower receives from his assistant a lump of clay, places it upon the lathe at the head of the wheel, and presses it with his two hands. The circular movement causes the clay to rise in the form of a cone; this he then depresses, and allows it to again rise until ready for fashioning. This is done by inserting the thumb and finger of one hand, and moulding the shape with the other, the wheel all the time performing quick revolutions. Modern inventions have introduced steam for the motive power, but the action has to be regulated by the foot; with this exception, the apparatus is exactly the same as used by the ancient Egyptians. At one time *all* the hollow pieces were made on this wheel, but now many are made in moulds, so that the articles may be embossed with a minimum of labour. When the articles have left the moulds and the thrower respectively, they are then passed to the turner's hands, who fixes them upon his lathe, finishing the edge and feet, thus completing the form. Then they go to the handler, who has previously made his handles in moulds; he then fixes them to the cups or vases with liquid clay. The burning—to which I shall come presently—firmly unites the two; and it is said that the handle is really the strongest part of the article.

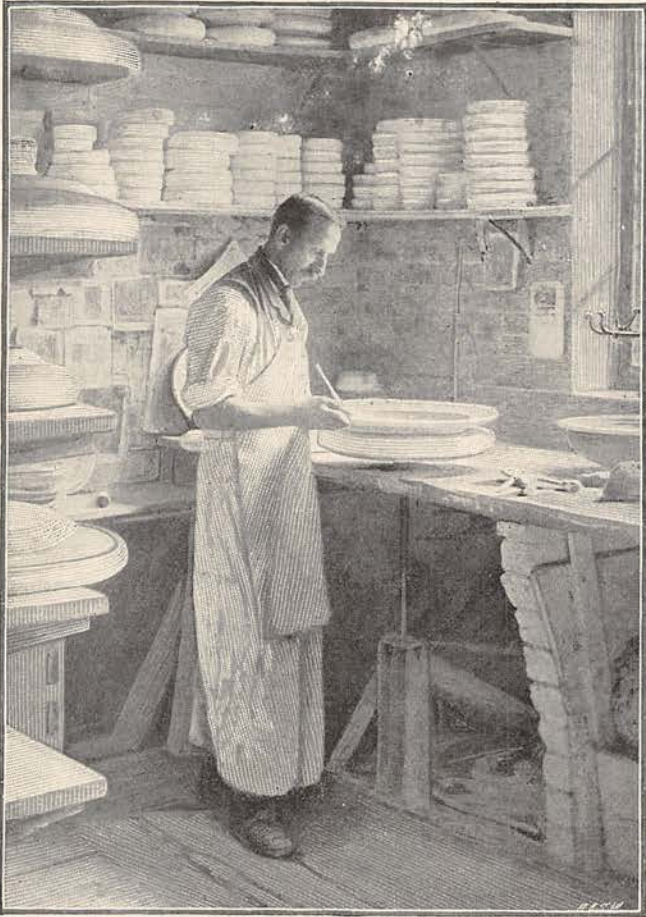
Now for a few words respecting plates and dishes, technically known as "flat pressing." For this process the clay is weighed, to insure accuracy of size and weight;

it is then beaten out into flat circles and placed on the plaster-of-Paris "form moulds," these latter in their turn being fixed on horizontal lathes. First the clay is firmly pressed with wet sponges while the lathe revolves; then a large knife is drawn across the surface (which keeps it from cracking in drying), then worked round the edges with a profile. It is now ready for the drying stove, into which it is placed, mould and all, the heat afterwards producing the separation. Covered dishes, basins, tureens, etc., are all made in moulds, to which they are carefully pressed with a wet sponge, the moisture allowing the clay in a short time to contract so that the piece can be easily taken out.

One of the most interesting departments, perhaps, is that of the casting or figure making; the modeller first building the figure, which is then cut into pieces to be moulded. Many of the more beautiful figures are cut up into as many as thirty pieces, *each separate part being put into a different mould*. I may



HANDLERS.



FLAT PRESSING : FORMING DISHES AND PLATES.

say that it is not a clay substance used in this process, but a liquid similar to cream in consistency ; this is poured into the moulds in the first place, and left to stand until sufficient of it has adhered, the remainder then being poured out again. In a few minutes it is sufficiently firm for the workmen to handle. Each separate piece is then arranged on a plaster slab, any superfluous clay trimmed from each one, and liquid applied to any parts where necessary. The parts are then re-fitted by means of the liquid slip until the entire figure is rebuilt, a camel's hair pencil being brought into requisition to clear the joins. The figure has then to be propped or built round with pieces of clay ; and it is ready for the oven. I may add that every figure must of necessity be made larger than the actual size required, as so much shrinkage takes place in the after processes. This, often ranging from fifteen to twenty-five per cent., is one of the greatest difficulties to be contended with.

It arises principally from the loss of water, and is greater in porcelain than in earthenware ; but it is, perhaps, hardly necessary to say that with such skilled workers as are here employed the accurate judgment given by long practice considerably reduces any likelihood of error.

The various articles of which I have spoken are now ready for the baking, and are taken to the placing house, where are piles of seggars of every imaginable size and shape. They are entirely made of fire-clay, and are impervious to heat. Into these seggars the articles are put : cups and bowls in oval ones, ranged on china rings to keep them straight ; and plates and dishes in flat ones, each in its own bed made of carefully prepared ground flint. The seggars are now filled, and are placed in the ovens in piles one above each other ; this must be very carefully done in order to keep the pressure perfectly even, as the slightest irregularity, when the oven is highly heated, might cause an entire pile to topple over, and so entail a great amount of damage and loss. These kilns—the exteriors of which are seen in our first illustration—seem to be of just the same formation now as they were centuries ago, presenting a

sort of enlarged bee-hive appearance ; they are constructed entirely of fire-bricks, with several exterior strong bands of iron to prevent expansion when subject to great heat ; the interiors are about 14 feet in diameter. The majority of the kilns have eight huge exterior fireplaces, the flues of which from opposite directions lead directly into the oven. On the exterior may be also seen various apertures, known as "test holes," from which the fireman can draw test cups to judge of the progress of the fire. When the kilns are filled, these test holes are carefully stopped up, and the entrance to the kiln is built in, so that every possibility of cold air is altogether excluded. An oven takes on an average forty hours to fire, about two thousand degrees of heat being then secured ; it then takes about forty-eight hours to cool. The entire burning process per kiln consumes something like eight tons of coal. After the seggars are withdrawn from the kiln the

articles are termed "biscuit"; this is quite hard, but porous. The flint is then rubbed off the surface, and a careful examination made; then everything is taken direct to the dipping room, where there may be seen a number of tubs containing the different sorts of glaze suitable to the articles which are presently to be dipped. This, on the face of it, is a very

as well as those in the drying room, are enveloped in white. Then they are all taken over to the department adjoining the glost, where they are again subject to a prolonged burning. This oven takes some sixteen hours to fire, and four hundred degrees of heat is the maximum. When the ware is taken out it is stored preparatory to decoration.



BISCUIT SCOURING.

simple process, but nevertheless it requires an experienced hand, as the work must be very evenly done.

The drying room is the next department, where the glaze is thoroughly dried on the ware. Here I noticed a number of girls were employed, working in an atmosphere reminding one of Rome in July. No one will wonder that they all looked pale and sickly; nor was I surprised to hear that very few could stand it for any length of time. When thoroughly dry, everything is taken to the trimming room for removal of any overplus of glaze; this is also done by women, who,

The decorating department is without doubt the most interesting of the entire works. Here you will see the painters at work on birds, insects, figures and landscapes, in addition to the general artistic embellishments. The first process consists of putting on the dull colours; these have to be burned in, then the ware is again worked upon and burned, coming out this time with far greater definition of the objects. The colours used are made from metallic oxides: copper giving green and black; iron, red; cobalt, blue; etc. The proper manipulation and correctness in drawing require very long practice, and in all

cases the painters commence training under special instructors at the age of fourteen.

Adjoining this department are the gilding rooms, where the beautiful and elaborate gold-work is all traced by hand. Here again a very special training is necessary. To better enable the artists in the obtainment of correct circles and exact finish, a mechanical apparatus is used, consisting of a stand with a revolving top, which, receiving the article, is carefully centred. The executant rests his hands upon this stand, and applying the gold-charged pencil, slowly turns the top round, which forms the edge in a most accurate manner. The gold supplied to the works has a curious appearance at first sight, looking much like

the one where the printing is done, and I may say this has been successfully carried out at the Worcester Works since 1756; the first productions being in crude form, and chiefly in cobalt blue. This is used more particularly for the common ware, and giving the outline of the patterns it saves much time and trouble in drawing, the colouring being done by other hands, chiefly women. The actual process of this is, that the pattern wanted is first of all engraved on a copper plate, which is then charged with oil and colour. Strips of tissue paper are then prepared with a solution of soft soap. In the photograph introduced on the opposite page you will notice the men at work at ordinary hand-etching printing presses; these print the aforesaid slips, which are then passed over to the women, who cut them out and place them in proper position on the ware, the porous nature of which absorbs the imprint in a few moments. When dried, they are immersed in water, and the paper stripped off. The articles are burned in the kilns in exactly the same way as other decorative work,



THE GILDING ROOM.

grains of brown coffee; it is chemically mixed with a little flux and quicksilver, then ground for thirty hours to render it in a fit state for use. Even then it has a dark inky-looking appearance, only showing its rich brightness after going through the enamel kiln. Special kilns are arranged for burning the colours and gold suitable for the glazed china on which the objects are worked, and a proper brightness is only obtained by a very correct burning operation. The principle of these kilns is very much the same as those used by goldsmiths, and the average time for burning is about six hours.

Another department well worth seeing is

and are then sent to the colouring department to be filled in. After the second burning they go to the burnishing room. On entrance here the gold-work is of a dull yellow colour, but is subjected to a cleansing process and burnishing by means of a bloodstone or agate, which gives the proper bright appearance. In the case of patterns chased upon the gold, a fine pointed agate is used to polish



THE PRINTING OR TRACING ROOM,

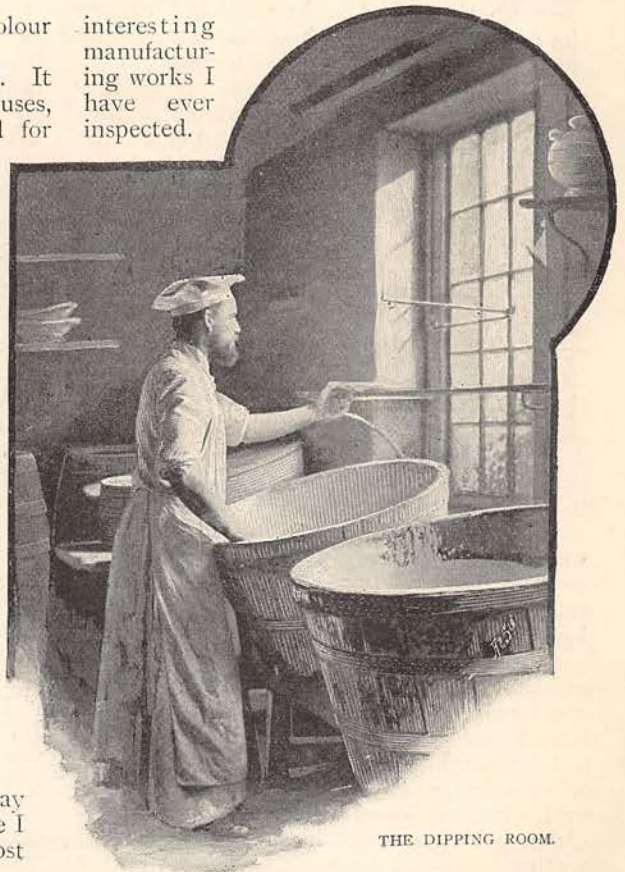
certain parts, leaving others to show a colour relief of dead gold.

The work is now practically finished. It remains only to send it into the warehouses, paper it and pack it, tubs being used for the latter purpose instead of cases.

Thus I have described about eighteen different processes, which even the most ordinary ornamental ware must go through before presenting its proper appearance. Apart from the extreme interest attached to the various processes, I was particularly struck with the very evident superiority of all the people engaged on the works; and when one considers the really artistic and accurate knowledge required, it will at once be seen that the average "factory hand" would be entirely at a disadvantage here. The salaries given, too, are good; special skill is rewarded by quick promotion; and, above all, every employé is on good terms with employer.

I could easily lengthen this paper with a description of the wonderful contents of the various show rooms and the museum, consisting of magnificent tea and dessert services, vases and figures—all but matchless and practically priceless; but similar things may be seen in our national museums, so here I conclude my account of one of the most

interesting manufacturing works I have ever inspected.



THE DIPPING ROOM.