ARTIFICIAL TEETH—THEIR HISTORY AND MANUFACTURE.

We were privileged, a week or two ago, to pass through the extensive manufacturing establishment of Messrs. Jones & White, Philadelphia (manufacturers of porcelain teeth), and were obligingly furnished with some items of interest in reference to the history of the art and the progress of the manufacture, which we think will be of interest to our readers.

It is but a few years since human teeth were used in artificial denture, as well as ivory, bone, the teeth of domestic animals, &c.; but the greater durability and cleanliness of porcelain teeth have caused all other substances to be discarded; it being a fact admitting of no contradiction, that no animal growth can long resist the rapid decomposition which all organic substances, devoid of vitality, are liable to, under the combined action of heat and moisture and the secretions of the mouth. To obtain artificial teeth exempt from these objections, it became necessary to seek them from inorganic materials.

The French dentists were the first to introduce mineral teeth; but their progress toward perfection was very tardy. The teeth, being composed almost entirely of clay, were very opaque, too highly colored, and destitute of any natural form. We were shown a treatise on dentistry, published in Boston in 1814, in which occurs the following remark:—"Artificial teeth, of a French invention, have been preferred in Europe, from their being made of mineral substances, and because they do not decay or affect the breath. They are, however, more brittle, less natural and more expensive than the kind in *common use*, viz., those made from the tusk of the hippopotamus." In 1818, or thereabouts, some experiments were made in the manufacture of porcelain teeth in Philadelphia; for the honor of being first in the business there are not less than a dozen claimants. For some years, however, the success attending these efforts was not very flattering, for, as late as 1822, in a treatise on dentistry (published in Boston), the following opinion is expressed:—"Artificial teeth have been formed of various substances; but those which are most perfect are made of the teeth and tusks of the hippopotamus or sea-horse. The mineral or china teeth are very imperfect; they have an opaque, earthy appearance, are brittle, and the sensation they produce when brought in contact with the natural teeth, in mastication, is very disagreeable." It was not until after 1830 that any considerable progress was made; all the teeth made previous to that time being very unsightly in color and shape, and *totally* unlike natural teeth. From that time to the present, the march of improvement has been steady. One after another, the difficulties in the way of imitation of the natural organs, on account of their semi-transparency, their peculiar color and their variety of tints, have been surmounted by perseverance and labor, until it would seem that, in point of strength, beauty of finish and perfect resemblance to nature in form, color and surface, as well as in the almost endless varieties of shape and style, and the ease with which they can be adapted to the great variety of cases which present themselves, and in the ability to resist the hammer in riveting and the blow-pipe in soldering, there is little to be desired.

Having thus glanced at the history and progress of the art, we come now to some details of the materials used in the manufacture and the processes.

The chief materials are:—1. *Feldspar.*—This mineral forms an essential part of most primitive rocks; it is found of various shades of white, blue, brown, red and green, and is composed principally of silica, alumina and potash. That which is white, or nearly so, is the only kind suitable for the manufacture of teeth. 2. *Silex or Flint.*—This substance abounds in almost every part of the globe; it exists, more or less pure, in the form of white sand; the kind best adapted to such purposes being that which is familiarly known as rock quartz or rock crystal. 3. *Kaolin.*—This is disintegrated and decomposed feldspar, and consists of nearly equal proportions of alumina and silica; it is of a slightly yellowish color, unctuous to the touch, and infusible, except with the addition of a flux.

Beside the foregoing, there are fluxes which, though differing from each other in the results produced, may all be described as *glasses;* they are used to determine the point of fusion desired of the different parts of the tooth.

The materials used in coloring are as follows:—1. *Titanium.*—This is a very hard, copper-colored and infusible metal, found in various localities throughout the United States. The crystals are of a reddish-brown color and shining metallic luster. It gives, when ground finely, a beautiful yellow color. 2. *Platina Sponge*—This is formed by dissolving platina in nitro-muriatic acid and precipitating. It gives a gray-blue color. 3. *Oxyd of Cobalt.*—This gives a bright blue color. 4. *Oxyd of Gold.*—This is used to give the red color, in imitation of the gums. These are the principal colors used. Singly, and in different combinations with each other, and with the minor colors, they produce a great variety of shades. About 130 distinct standard shades are made.

Now, as to the process of manufacture:—The feldspar is first submitted, in the crude state, to a red heat, and suddenly thrown into cold water. This is called "calcining," and its effect is to render it more easily broken. All impurities having been carefully removed, it is broken between flint stones, and so rendered fine enough to be put into the mill, which is formed of burr-mill-stone, with chasers of the same material. It is ground in water, floated off, and allowed to settle. The water is then evaporated, the spar dried and sifted, and is then ready for use. The silex is treated in the same manner. The kaolin is prepared by washing until perfectly free from impurities, and, when dry, is ready for use.

The coloring materials are also ground until reduced to an impalpable powder. These materials are then mixed in proper proportions, and made into a mass resembling putty. This is what is termed "body," and is now ready for the molding room. In this room are employed about 30 men. The molds in which the teeth are formed are made of brass, and are in two pieces—one-half of the tooth being represented on either side. The precise shapes desired are carved out with great care and labor, the holes to receive the platina pins drilled in each tooth, the two halves fitted accurately together, and the mold is ready for use. The mold must be made about a fifth larger than the size desired, to allow for shrinkage. These molds form a very important item in the stock of a manufacturer, numbering in the establishment before-mentioned over 700, making nearly 9,000 different shapes and styles, costing as high for some varieties as $50 per mold. There are from 6 to 24 shapes in each mold. The first operation in the molding room, after greasing the molds, is to place the platina pins (of which there are 10 sizes, differing in length and thickness to suit the different sizes of the teeth) in the molds; this is done very dexterously by means of small tweezers. The consumption of platina in this manner, in the establishment referred to, amounts to 900 ounces per month, which, at $6.50 per ounce, gives an outlay, for this article alone, of more than $70,000 per annum. In the cutting of these little pins, as in almost every other department of the business, great improvements have been made. In their earlier experience, 500 per hour were as many as could be made by an experienced workman. There can now cut to a given size and head 600 per minute! The end that is embedded in the tooth has a head somewhat like the head of a pin, to prevent it drawing out.

To return to the operation of molding. The pins being properly adjusted in the molds, the "point enamel," as it is called (a composition lighter in color than the body of the tooth), is placed in the molds by means of a small steel spatula; the body is placed in them in pieces corresponding to the size of the teeth; the top of the mold is then put on and the mold placed under a press, which compacts the mass. They are then dried by a slow heat. When perfectly dry, the top is removed, and the teeth will now drop out. In this state they are very tender, and require very careful handling. They are now placed on clay slides, and are ready for "biscuiting." This is done by subjecting them to a bright red heat, when they can be handled and cut or filed like chalk. They are now sent to the trimmers' room. In this room more than 20 girls are employed in removing and filling-up imperfections, cutting away the "spare edge" (as it is called) left in molding, and preparing the teeth for the next operation, which is enameling. The main ingredient of the enamel is spar, so tempered as to flow at a less heat than is necessary to vitrify the body; so that, when burned, the body will not have lost its strength by too much vitrifaction, and yet the enamel have the proper gloss. The enamels are put up in jars, colored as desired—blue, yellow, brown, &c.; they are mixed with water about the consistence of cream, and laid on with a brush. After drying, the teeth are examined to remove any enamel which may have run over the edges, smoothed with the finger, and are then ready for the gum room. The gum enamel is substantially the same as the other enamels, colored to imitate the natural gum, and is put on with a brush in the same manner. From this room, the teeth are passed into the gum-trimmers' room, where the edges are dressed with a file, and the arch of the gum made rounding and true with a small, pointed instrument. They are then placed on clay slides, and are ready for the furnaces. These are structures of fire-brick, of which there are 13, holding over a half tun of coal each, with a clay muffler in the center. Beneath and around this the coal is placed, the door-way walled up, and the fire started. They burn three or four such furnaces daily. The early part of the fire is used for biscuiting the teeth, and after the coal is thoroughly ignited and the heat becomes sufficiently intense, the burning is commenced. One slide, holding about 150 teeth, is put into the muffler at a time, and occupies (depending upon the state of the fire) from 10 to 30 minutes in burning. The practiced eye of the burner must detect, from the appearance of the teeth, when they are properly burned. If taken out before they are done, the enamel will craze or crack in cooling; if a little too much done, the surface will be too glossy, and the body will not be strong. When cool, the teeth are removed from the slides, and, if perfect, placed upon wax cards in sets, and are ready for sale.

There are now engaged in Messrs. Jones & White's establishment over 100 persons, nearly one-half of whom are females. They can turn-out, in finished teeth, with their present force, over 200,000 plain teeth per month—of course, not so many gum teeth, as there is much additional labor on these. The amount of wages paid weekly is over $900. Independent of the trade in this country, they are supplying orders for all parts of the world where the advancement of civilization has rendered the *dentist* a necessity.

MAN SCIENTIFICALLY DESCRIBED.

In a recent lecture, delivered before the Royal Society, in London, by Professor Owen, D.C.L., F.R.S., as reported in the *Engineer*, he described man as a specimen of organic nature, as follows:—The fourth and highest type of mammalian brain rises at once, and without transitional rudiments of the hippocampus minor, hinder horn of lateral ventricle, or concomitant lobe of cerebrum protruding backward beyond the cerebellum, to that marvelous structure which is peculiar to our own species. The sole representative of the archencephala is the genus homo. His structural modifications, more especially of the lower limb, by which the erect stature and bipedal gait are maintained, are such as to claim for man ordinal distinction on merely external zoological characteristics. But his psychological powers, in association with his extraordinarily developed brain, entitle the group which he represents to equivalent rank with the other primary divisions of the class mammalia, founded on cerebral characters. In this primary group man forms but one genus—homo—and that genus, one order, called bimana, on account of the opposable thumb being restricted to the upper pair of limbs. The mammæ are pectoral; the placenta is a single, sub-circular, cellulo-vascular, discoid body.

Man has only a partial covering of hair, which is not merely protective of the head, but is ornamental and distinctive of sex. The dentation of the genus homo is reduced to 32 teeth, by the suppression of the outer incisor and the first two premolars of the typical series on each side of both jaws, the dental formula being:—

$$i.\frac{2-2}{2-2},\ c.\frac{1-1}{1-1},\ .\frac{2-2}{2-2},\ m.\frac{3-3}{3-3}=32$$

All the teeth are of equal length and there is no break in the series; they are subservial in man not only to alimentation but to beauty and speech.

The human foot is broad, plantigrade, with the sole not inverted, as in the quadrumana, but applied flat to the ground. The leg bears vertically on the foot; the toes are short, but with the innermost longer and much larger than the others, forming a "hallux" or great toe, which is placed on the same line with, and cannot be opposed to, the other toes; the pelvis is short, broad and wide, keeping the thighs well apart, and the neck of the fe-