CHINESE IRON-FOUNDRIES AND RICE-PAN CASTING.

As a notable example of the patient plodding industry shown by the Chinese, may be instanced the manufacture of the very thin cast-iron ricepans which may be seen in any cook-house in Hong-Kong. The principal seats of this industry are at the towns of Sam-tiu-chuk and Fatshan. The iron used is obtained by smelting magnetic oxide. The ore is broken up and smelted with charcoal in a very primitive smelting-furnace some eight feet high. The cupola is cone-shaped, having its apex at the bottom. The single tuyere pipe is of earthenware, the opening for the emission of the blast being inclined downwards. The furnace itself is of earthenware, strengthened by hoops and longitudinal straps of iron. The whole is lined with clay several inches thick. The internal diameter at the bottom is about two feet, and at the top three feet and a half; the inside depth being about six feet. The blast is produced by a rude bellows, formed of a wooden box five feet long, by three in horizontal, and a foot and a half in vertical section. This box is divided longitudinally into two compartments, each eighteen inches square in vertical section. In each of these compartments a piston works, the valves being so arranged that one piston is effective in the up, and the other in the down or return stroke. As there is no air-chamber, the blast is not perfectly continuous. The fuel used is charcoal; and the furnace, being first heated by starting a fire with fuel alone, is then filled up with alternate layers of charcoal and ore in small fragments. The blast is urged, and, after a sufficient time has elapsed, the molten metal is drawn off from a tap-hole at the bottom, and cast into ingots. These, when intended for export, are afterwards reheated in an open forge.

For making the very thin ricepans, which are cast without handles, pure iron of native manufacture alone is used. The moulds in which the pans are cast require weeks of tedious and patient labor to bring them to perfection. They are composed of two parts, an upper and a lower, and are made of carefully puddled clay. The great secret of the process which enables the Chinese founders to cast their iron pans of such large diameter, yet so thin and light as to be scarcely thicker than a sheet of paper, appears to be the use of highly heated moulds and pure charcoal pig-iron. When the ovens and their contents have cooled down, which takes about two days, the luting attaching the upper portion of the mould to the lower is carefully removed, and, the moulds being separated, the pan can be extracted. When the operation is successful, the same mould can be used several times. The pans now have each attached to its bottom a lump of iron, which, from the extreme brittleness of the pans, requires the greatest care in its removal. These runners are carefully sawn off, and the edges smoothed down; the pan is then ready for the export market. Handles are attached to these pans by the retail dealers.

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The pans made at Fatshan differ from the preceding in being cast with handles attached near the rim to the inner surface of the pan, which necessitates the breaking of the mould at each casting. They are usually cast much thicker and heavier than those of Sam-tiu-chuk, and occasionally one-third of foreign pig-iron is mixed with the native iron for casting. In other respects the process followed at both places is the same.

GREAT ANTIQUITY OF THE AMERICAN RACES.

IN an article in the *Zeitschrift für ethnologie*, on the great antiquity of the human races, Dr. Kollmann takes American material to test his theory that the craniological varieties of mankind existed in quaternary times as they are found to-day. For this purpose, accepting the geological evidence of their antiquity as conclusive, he brings together observations and measurements upon crania from California, Illinois, Patagonia, central Brazil, and Buenos Aires. The first will be recognized immediately as the celebrated Calaveras skull. To the original measurements of Dr. Wyman, the author adds his own measurements taken upon Whitney's plate ('Auriferous gravels of California'), using for a term of comparison the heads of six Indians who visited Basle in 1882. He finds the Calaveras skull does not resemble European, but Indian crania in specific race-characters, which have persisted since the glacial epoch. The less familiar cranium from Illinois, known as the McConnel skull, was found enveloped in drift material in a cleft in a rock-bluff. It is now owned by Dr. Schmidt of Berlin, whose measurements are incorporated in the text with his conclusion, from a comparison of this skull with those in the collections at Washington and Philadelphia, that it is not unlike more recent long skulls from Illinois.

The rest of the study is based on material from South America. On the banks of the Rio Negro, Patagonia, in a stratum similar to that of the quaternary loess of the pampas, Moreno found two skulls which seem to him identical with existing forms. At the last Congrès des Americanistes, 1883, Lütken invited the attention of craniologists to the as yet unmeasured material representing the remains of thirty individuals, which Lund obtained in the cave of Sumidouro, near Lagoa Santa, Brazil. In a recent visit to Copenhagen, Dr. Kollmann measured four of the best preserved male crania, which, like one given by Lund to a Brazilian collection, and measured by Lacerda and Peixoto, are long, with broad faces. According to the latter authorities, they resemble the heads of Botocudos. The last of the group is one taken by Roth from the upper pampas formation of northern Buenos Aires. To Virchow, who took its measurements upon photographs, it recalled involuntarily the brachycephalic, prognathic skulls of Sambaquis. Nehring also stated to the Anthropological society of Berlin, that he has in his possession a Sambaqui skull from Santos, which presents a real resemblance to this.

Assuming, as he does, that these crania are all pre-glacial, and finding among them both long and short skulls, Dr. Kollmann arrives inevitably at the conclusion that already in pre-glacial times the men of America had cranial and facial forms widely differentiated into varieties which have persisted until the present time, in spite of lapse of time, and change of environment. The persistence of type leads him further to question the probability of an alteration of race-characters from change of environment, or the possibility of the development of another, more perfect race.

A KINDERGARTEN SYSTEM OF CHEMISTRY.

IT appears to be a law, that, whenever a hypothesis of fundamental importance is introduced into a science, it is utilized for all sorts of purposes for which it was never intended. This is certainly true of the valence hypothesis in chemistry. The conception that the smallest particles or atoms of the elements differ from each other in regard to the number of other atoms with which they can enter into combination, is the result of a profound consideration of the facts of chemistry, and its significance can be comprehended only by those who have made a deep study of these facts. The valence hypothesis is utterly meaningless to those who do not know considerable about chemical substances and their action upon each other. Notwithstanding this, the mere mechanical considerations involved in it are so simple, and can be so readily illustrated, that we find incompetent teachers thrusting them upon the attention of beginners even before any sort of notion has been conveyed in regard to the nature of chemical action, or of the distinction between elementary and compound bodies. We need only pick up any one of the small text-books in common use, and, ten chances to one, we shall find an example of the kind of treatment referred to.

It would be difficult, however, to find any thing to equal "The chemists' and students' assistant, or, Kindergarten system of chemistry," which has recently been brought to our attention. The author or inventor of this system evidently thinks that the essential things in chemistry are not compounds, but formulas; that, if one can manipulate formulas with sufficient skill, he knows chemistry. Now, in order to deal with the formulas, it is not at all necessary to know any thing about the compounds represented. A very few simple principles, which a child can thoroughly comprehend, are alone required. We are therefore at last in a position to study chemistry without any reference to chemical phenomena. The odor of chlorine and of sulphuretted hydrogen, the activity of oxygen, the conduct of acids towards bases, need no longer be known to the student of chemistry. Laboratories for instruction are superfluous. All we need is 'The chemists' assistant.' This wonderful thing consists of a box containing a number of blocks of different shapes. The simplest blocks, which represent the simplest atoms, have but one angle: others have two, three, four, five, or six angles, and represent respectively the bivalent, trivalent, quadrivalent, etc., elements. A collection of such blocks by itself is not a very harmful thing, and we can conceive of the blocks being used in connection with a course of instruction in chemistry without leading to an entirely false notion concerning the things represented. Their use, however, would require the greatest care, as they would be more likely to do harm than good. When we read the author's explanatory words, we first recognize the enormity of the system with which he has presented us. After stating in general terms how the blocks are to be used, he says, "For lectures or class illustrations, this system will be exceedingly useful; for the illustrations on the charts and blackboard will address the eye as well as the mind of the student, and consequently will lead to a quicker conception of the subject lectured upon.

"As this system is identical with that of the kindergarten, the young students will be charmed with the various forms which can be made by the elements, some of which are exhibited in the following illustrations."

We then find some illustrations of chemical reactions which certainly do charm the eye of even the old student. The first one represents what takes place when water acts upon calcium oxide. Oxygen, with its two points, joins two single-pointed hydrogen blocks, and we have water. Calcium (two-pointed) fits close to oxygen (also two-pointed), and we have lime. The change to the hydrate, or, as common people call it, slaked lime, is too abrupt: we therefore have an intermediate stage represented. This is called the 'cracked-up' stage, though, from the general appearance of the formulas, we are inclined to think that it might better be called the 'exploded' stage. Finally order is restored, and we have a peaceful, symmetrical-looking group, which, we are glad to be told, is 'calcic hydrate.' The idea of including in chemical equations the intermediate 'cracked-up' stage, is, we believe, original

The chemists' and students' assistant; or, Kindergarten system of chemistry. By WILLIAM FARMER. New York, *Author*, 1884.