PARIS EXPOSITION—THE CHAOTIC STAGE.

Paris, March 29, 1867.

A FAIR ADMISSION.

It seems to have been the fashion among those who have written in reference to the coming Exhibition, whether speaking of the building or speculating on the probable interest of the articles to be exhibited, to give only the most qualified praise of the one and to express serious doubts as to the other. Of course if one is desirous to convey the impression that nothing whatever can be so imposing as to awaken any new sensation in the mind of the writer, he must express no extravagant admiration of what he beholds, no matter what his own impressions may be. As, however, for my own part I feel more anxious to convey to the minds of those who are not able to see for themselves, the impressions that are produced on a disinterested observer, as nearly as possible as they exist in his own mind, than to assume any affected indifference to the achievement of another nation, I shall admit frankly, that I experienced no little astonishment in walking around yesterday through the various departments of the main building and among the numerous additional edifices with which the surrounding park is filled. It must be admitted that no very extensive view is obtained from any one point, but this defect to the mere sight-seer will, I think, be amply compensated by the many beautiful promenades which will be prepared outside of the building, and which will no doubt, in the hight of the season, present as brilliant a spectacle as one can well imagine even in Paris.

EXTERNAL APPEARANCE.

It is extremely difficult, I am aware, to convey any idea of the size of such an inclosure, and therefore I shall not repeat the number of acres comprised in the park or occupied by the building. Perhaps some comparative notion may be formed from the statement that the central garden, which has an area equal to one twenty-fifth of the whole of the main building, is of about the length of Union Square, New York, by perhaps half the width of that park. Of the concentric elliptical rings of which the building is composed, the outer and in every way the largest one is devoted entirely to machinery. Outside of this, however, is a continuous restaurant more than half a mile long but not having the hight of the rest of the building, and therefore not prominent when the latter is viewed from a distance. The outside of this is entirely of transparent glass. and a very pleasant prospect is therefore presented to one while sitting at the tables of the surrounding grounds and buildings, as well as to promenaders under the roof which projects outward from this portion or appendage of the building. I was not particularly struck with any resemblance of the building to a gas holder, as the large round-topped windows of which the sides are principally composed relieve very much the unornamental appearance which I had supposed it to have. In order to give a clear space in the interior of the machine department, the main uprights in the walls of wrought iron are made very stiff and carried up to such a hight above the springing of the roof as to allow the necessary ties to pass above the crown of the arch. This adds very much to the appearance of the interior. The roof is, as might be supposed, tastefully painted, and though the girders and beams of which it is formed are all in sight, it is much more pleasing to the eye than where a maze of tie rods and braces breaks up the view.

INTERIOR OF THE MACHINERY HALL.

The large windows which, as already stated, occupy nearly the whole of the outer wall from the level of the exterior restaurant to the roof, are hung with ornamental shades bearing paintings of the well known antiquities of engineering or inscriptions appropriate to the nationality of the section in which they are situated. . . . . The moving machines are all arranged near the longitudinal center of the hall; on each side of the moving machinery are aisles for spectators; and on the wall sides of the hall are arranged the machines not in motion and kindred objects. The arrangements for bringing articles to their places in the building are very simple and good. From the lines of railway in the park, branches enter the building at each or many of the radial aisles or streets, as they are called. Then at each intersection with one of the circular aisles a turn-table is placed, and these aisles are themselves at present occupied by lines of rails, so that each article is brought by steam or horse-power directly to its intended position and there deposited by a steam crane also traveling on the same railway. The various sections are decorated in styles appropriate to the nations to which they are allotted, and in some cases the appearance is very rich, while in all the effect is much more magnificent than any thing that one can often see elsewhere.

FRENCHY GARDENING.

The gardens are certainly laid out with great taste, though one sees many things which are peculiarly French, in the way of trained trees whose branches are made to assume the most unnatural and fantastic forms, and similar fanciful extravagances. Along one of the promenades is a continuous bed of these. At the ends are trees whose branches are all in two directions at right angles to each other, thus forming appropriate corner pieces, while at other points they are arranged in symmetrical forms of all imaginable kinds. Artificial streams have been formed, or rather the beds of cement for them are prepared though the water has not yet been admitted, and over these are rustic bridges also formed of cement, but molded and painted in such a way as to form a very good imitation of the bark of wood. The grounds are full of ornamental buildings and cottages of all kinds, which though interesting and even elegant in many cases give it rather a crowded and heterogeneous appearance. Still, though the general effect is not the most pleasing, each part is in itself enjoyable and will afford instruction and amusement to the thousands who will visit it.

Slade.

Science Familiarly Illustrated.

How Cast Iron is Made.

Many of our readers probably suppose that what we commonly call iron is an elementary natural substance, and would be surprised to learn that like steel it is an artificial article of a complex character, answering to nothing found in nature. At the same time it is remarkable how imperfectly both the character and the formation of an artificial product may be understood by those who make it. It is not many years since real iron was first refined from the chemical compound of that name, and found to be a white soft metal, looking like silver, and easily pared with a knife. Even now, no one can tell us precisely what is done in the interior of those great, glowing piles where "ironstone" is melted up with limestone and comes out in the hard, brittle, granular, gray substance known as cast iron. It is a process that has come down to us from antiquity, where it was developed by experiment with little aid from science. Important as the improved and extended iron industry is to modern life, it is impossible for us to conceive of the hungry need that pricked on the primitive men in their search for the precious material of tools and above all of weapons. Nothing else could account for the success with which they felt their way to processes and results in manufacture, of the chemical nature of which they had not the slightest conception, and which we but imperfectly understand. Mr. Wm. Crossley, F.C.S., manager of the Ormesby Iron Works, England, in a series of papers lately published in the *Chemical News*, confesses this singular ignorance, and gives his theory of the process, and what it ought to be, from which we have already quoted as interesting to our more expert as well as youthful readers.

A blast furnace, we should first explain, is not a mere melting furnace, but a chemical retort for separating oxygen from the oxide of iron, by means of the superior affinity of the former for carbon. It is substantially an upright tube, varying from fifty to a hundred feet in hight; not to afford a chimney draft, for that is superseded by a mechanical blast, but to afford room for the chemical process demanded. By this process the iron is set free from the oxygen to which it had been subjected in the state of nature; but it exchanges that master for another—carbon—making it a carbide of iron, impure with other foreign matters, such as sulphur and phosphorus, which it derives from nature or the fuel and minerals in which it is smelted.

The smelting retort, as we will continue to call it, is made of various diameters, according to the hight, and the weight of ore intended to be reduced at a charge. Some lately built are as much as 102 feet in hight and 29 feet inside diameter. First, a hot fire of coke or charcoal is made on the hearth at the bottom, fed from the top and gently urged by a pressure of air through two tweers or inlet tubes, 2 to 4 inches in diameter, placed near the bottom and connected with blowing engines which will be made to drive a blast of great power through the retort, as soon as it is charged with ore. On the top of the fuel, which extends in the first place well up the shaft, the ore is fed in, mixed with limestone, both previously calcined by roasting in the open air, to drive off moisture and organic matter. The ore consists of iron in combination with oxygen, and this oxide (the same thing as "rust") is also mixed with various proportions of earthy matter which is chiefly silicic acid. To disengage this earthy matter from the ore, and to prevent the ore when melted forming with the silicic acid a silicate of iron (glass) and thus being lost, limestone is mixed with it, and the first effect of the hot gases passing upward is to decompose this as in a lime kiln, yielding lime. The lime, and the silicic acid or earthy matter mingled with the oxide of iron, now begin to act upon each other and form a crude silicate or glass which will soon be easily melted, and is then called slag. It is probable that at about the same time the carbonic oxide (carbon imperfectly oxidized, having only half the oxygen it will take) finds the iron oxide sufficiently heated and freed to deliver up its oxygen, which the carbon seizes, becoming carbonic acid, and leaving the iron free from oxygen and ready to melt as soon as it has settled a little further down into the intense heat. Here the slag or impure silicate melts, and a little later and lower the freed iron also melts, and at the same time probably combines with a portion of carbon from the fuel and thus subjects itself to what we have called its new master, becoming a carbide as it was before an oxide of iron. The carbide of iron (which we call iron for shortness, and because we used to think it so) falls by its gravity to the bottom or hearth, the slag swims on its surface, and the chemical work is done. The workmen open a door just at the level of the surface of the iron, and haul off the slag from it, after which a small hole at the bottom of the hearth is opened, and the iron runs out into molds.

This operation has occupied from 24 to 48 hours, according to the hight of the retort, and meanwhile alternate charges of fuel and minerals are fed in at the top until the whole retort is filled and kept full by continued charging as fast as the contents descend and make room.

Entering (mentally) with the blast at the bottom of the retort, let us trace the operations of the fuel and air ascending the shaft, as we have traced the descending materials, ore and limestone.

For many ores such a degree of heat is required—and for most it is advantageous—that the air blast must be heated before it enters. The blast has lately been brought to a temperature as high as 1,100°, and a great advantage in the heat from a given fuel is obtained by feeding it with hot air—Mr. Cross ley thinks four fold, up to the point where the blast shall be as hot as the fire itself. The first operation is probably the formation of carbonic acid by the union of two parts oxygen with one of carbon, and this evolves heat enough at this point to enable another portion of the carbon to recover an equivalent of oxygen from the carbonic acid, reducing the latter to carbonic oxide, which ascends until it meets the iron oxide and regains from it one equivalent of oxygen, becoming again carbonic acid and leaving the iron free, as we have before seen. In the improved modern furnaces, the carbonic acid, escaping carbonic oxide, free carbon or smoke, and other gases, are caught at the top of the shaft in contrivances for the purpose and taken off in pipes to reservoirs, whence they are fed into independent furnaces and burned with other fuel and air blast, to heat the blast for the smelting furnace and raise steam for the engines.

BUSINESS AND MANUFACTURING ITEMS.

Western Manufactures.—The age of our eastern manufactures not only renders them the representatives of American manufacture in general, but has established the East as the only seat of home manufacture worthy of notice in the eyes of most of men interested in our national activity.

In the mean time the rich western states are working quietly and slowly on, and before long they will step in beside the ponderous eastern production of skill and handicraft.

As an instance of this silent progress we mention the town of Peoria, Ill., little noticed and hardly ever mentioned in connection with manufactures, while in these it surpasses many a place of double its population, standing behind none in proportion to the latter.

Peoria is situated on the west bank of the Illinois river and lake Peoria, which is simply an enlargement of the breadth of that river midway between Chicago and St. Louis. An immense bed of bituminous coal underlying it, the town possesses one of the great elements of manufactures, abundant fuel, which costs in Peoria about one third of what it is worth in Chicago, St. Louis or Cincinnati, and about one half of what it does in Pittsburgh; its price varying from seven to eight cents per bushel or about two dollars per tun, which is about twice the value of that material before the war. This coal is produced from one hundred and three coal banks, actively worked around the city.

The communications of the city with the world by rail and water are quite respectable, eight different lines of railroads meeting there, while the Illinois river, by way of canal and lakes gives a desirable water communication with the East, and by the Mississippi and tributaries with the South and West. Being situated in an agricultural district the chief branch of manufacture is that of highwines, of which seven hundred and sixty-two barrels are produced daily, in fourteen distilleries.

The revenue which accrues (or ought to) to the government from this single branch of industry in Peoria, amounts to the neat little sum of $60,960 a day; which is doing pretty well for a city of 20,000 inhabitants. Three distilleries burnt down within the last two years had even a greater capacity than any of those now existing. There are also eleven rectifying establishments in Peoria, producing in the aggregate 375 barrels of cologne spirits per day.

Eight establishments produce two hundred barrels of beer per day, and four vinegar factories, sixty barrels of vinegar, which is said to be sufficient to sour the entire population of the town, otherwise very amiable. The Peoria Pottery Co. formerly produced all kinds of pottery, but is now confined to yellow stoneware. The clay for the works is brought from a distance of eighty miles. It is mixed with water by exceedingly heavy machinery to a uniform mixture, having the consistency of milk, which passes through screens, where sand and other coarse impurities are retained.

The liquid passing through the screens travels over a long inclined plane, where the coarsest clay is again deposited, while the finer, suspended in water, runs into large tanks, where it is deposited by rest. Afterward the clay paste is transferred into a huge sheet iron pan, and dried by heat to a consistency adapted for molding. The clay remains upon the plaster molds for twenty-four hours. The earthenware is then dried around stoves for a few days, then introduced into mufflers and placed in a large furnace.

The Peoria Paper company manufacture all kinds of wrapping paper, but chiefly straw paper, the material for which is there cheap and abundant.

An equally extensive establishment, The Peoria Starch factory, produce at the rate of a tun and a half per day. There is also a woolen mill, three coffee and spice mills, eight flour mills with a daily product of 1930 barrels of flour, and barrel factories of a capacity to supply all the establishments before mentioned. All these establishments require founderies and machine shops, of which there are four, beside two brass founderies, two boiler shops, two copperworkers and two millbuilders. Four plow factories, for cultivators, and two for cornplanters; two for pumps and wooden tubing, one for water buckets and drawers, three for sash, doors, and blinds, five for brooms, two for lard oil and candles, and wagon, saddle, and harness factories etc., as abundant as in most other cities, complete our survey of Peorian manufactures. About ninety engines are employed in these establishments.

Joseph Hirsh.

The Gatling Battery is attracting favorable notice in England, where a trying experiment has been sustained by it under direction of the Government, at Shoeburyness. Owing to an accident, one of the barrels could not be fired; nevertheless, 76 shots were made in 80 seconds, discharging 1,216 bullets, 668 of which were counted on the target in spite of a strong cross wind.