THE PROGRESS OF CHEMISTRY IN 1872.

The year that has just closed has not introduced to us any startling discovery, or produced an invention which is likely to work a revolution in any art; but it has added its fair share to the general stock of knowledge, and its contributions may be said to compare favorably with those of times past. It may be well to review some of the most conspicuous chemical events of the old year, in order to make a fair beginning on the new. The continuous and economical manufacture of chlorine gas, directly from hydrochloric acid without the intervention of manganese dioxide, as proposed by Deacon, has been improved and perfected during the year, and may be set down as one of the most important contributions to chemical technology of recent times. A heated mixture of atmospheric air and hydrochloric acid gas is made to pass through tubes filled with fragments of brick saturated with a solution of sulphate of copper, or is driven through a reverberatory furnace, the floor of which is covered with bricks filled with a copper salt, and at a temperature of 370° to 400° C. The hydrochloric acid is thus decomposed and chlorine gas is liberated. If the heat be increased to 425° C. considerable chloride of copper is volatilized and there is a considerable loss of the reducing material. The importance of an invention of this character can readily be appreciated by all who are familiar with the enormous consumption of chlorine in England and this country. Hydrochloric acid may be said to be an incidental product in England, and it has therefore long been employed in the production of chlorine by the manganese process. To enable the manufacturer of bleaching powders to dispense with manganese and substitute a continuous copper method constitutes the chief merit of Deacon's invention.

The artificial production of alizarine from coal tar, which merely dawned upon us a year or two since, has, during the past year, been brought up to the standard of a commercial success. The reasoning by which the inventors of artificial alizarine arrived at their results is one of the best illustrations of the value of applying real scientific training, to the solution of technical problems. Two chemical manufacturers in Germany, Messrs. Graebe and Liebermann, in their study of a class of bodies called *quinones*, came to the conclusion that alizarine was one of them, and to prove this, they passed the vapor of natural alizarine obtained from madder over heated zinc dust, and obtained a product which proved to be in every way identical with anthracene. Having made anthracene from alizarine, the next step was to reverse the process and produce alizarine from anthracene; this they were finally enabled to do in a circuitous manner, but sufficiently economically for commercial purposes. Artificial alizarine is now largely made and employed as a substitute for the natural Turkey red of the madder root. Attention has consequently been called to anthracene, which, occurring in small quantities among the products of coal tar distillation, has not been hitherto much studied or appreciated. The demand for it as a source of color has invited the study and invention of chemists, and during the past year, Messrs. Fenner and Versmann have discovered more economical methods of preparing it from pitch as well as tar, and there is every indication that they may be able to separate it commercially from the native asphaltum of Trinidad. Thus anthracene, which few persons have ever seen or heard of, bids fair to become an article of large manufacture for use in the production of colors. There are so many articles of value which are now made from coal tar that it is safe to predict that, if it were not incidentally produced in the manufacture of illuminating gas, we should soon have works started to give us the tar required in numerous industries. It is not many years since the tar of the New York gas houses was allowed to run away into the North river. It would certainly be curious to see works created to manufacture it, while the gas was allowed to escape into the air. Such a reversing of the ancient order of things is not impossible, however improbable it may seem. At the present time, there are fifty-six distinct products resulting from the distillation of coal. Only a few of these are of direct practical value, a majority of them being less known than was anthracene a year ago. Every year witnesses the picking up and utilizing of one or more of these compounds; and if chemists did not continually add to the number, we might hope before many years have passed to get through the entire list.

There is another product of Nature which has received great attention during the past year, and that is cellulose. The chemical properties of cellulose have long been understood, and its use in many arts dates back to remote antiquity; but nevertheless it has been subjected to close scrutiny in late years, and its applications have been proportionately extended. We have paper, gun cotton and clothing made from cellulose; and during the past year, we find it taking the place of parchment and membrane for many purposes; and, as a good solvent has been found for it, it is made into strong bands to be employed as substitutes for leather, and is applied to the manufacture of roofing, gas pipes, water conductors, safety fuses, hats and boots; and the best photographic collodion is now made from precipitated cellulose. These are only the beginning of the purposes to which it is safe to predict that cellulose will some day be applied.

The chemistry of fermentation has been the subject of considerable controversy during the year, and Pasteur, the champion of the germ theory, has invented a new process for brewing beer, which is attracting much notice in this country and Europe. We gave a full description of it a short time since. According to Pasteur's process, the fermentation is accomplished with the exclusion of the air, and thus the deterioration due to the absorption of oxygen is avoided. It remains to be seen whether the French "revenge beer" will eventually drive the German lager from the market.

In the economical use of furnace slags, there has been much improvement during the year. The unsightly accumulations about blast furnaces bid fair to disappear; and by degrees, we shall see the slags worked up very much as the waste tar has been, after many years of study. The slags are useful for glass, for cements, for fluxes, for artificial stone, for alum, for fillings, and for the production of chemical salts. Many German furnaces now sell them for a moderate sum, which will doubtless be increased as new uses are discovered. The progress in this direction during the past year is one of the most satisfactory we have to record.

The interest attached to nickel plating has in no way flagged; but, on the contrary, the processes have been greatly improved and the application of the art has been extended in all directions. One of the most important improvements has been that of nickel plating for facing type. The hardness of nickel makes it very desirable for this purpose.

In the direction of tanning, we have recorded a few inventions; and the attention of chemists to the best methods for obtaining concentrated extracts of tannic acid is meeting with encouragement.

The general topic of disinfectants and antiseptics has been discussed and experimented upon, but not much valuable information has been added to our previous store of knowledge. The distinction between a disinfectant and an antiseptic is now better understood, and as the paths of investigation are cleared of rubbish, we may anticipate important discoveries in this line in the future.

The cheap production of hydrogen was announced by Du Motay, and the oxyhydrogen illumination of the same inventor still struggles on without finding acceptance among gas men. The ozone generators which are in the market do not offer this modified oxygen cheap enough to admit of its use as a bleaching agent. But ozone is still claiming a large share of attention. Houzeau quite recently invented an ozonizer, described in these columns last summer, similar to the one exhibited at the last fair of the American Institute. Now comes M. Boillot with a new and improved form of ozonizer constructed as follows: A tube 13 inches long and ½ an inch in diameter is covered externally, for 11 inches, with powdered coke attached with gelatin. Another tube 11 inches long and ½ inch in diameter was similarly covered with carbon and placed within it, and both enclosed in an outer tube of glass. A current of oxygen was passed between the cylinders, one tube was connected with one pole of an induction machine and the other with the other pole, and a silent discharge kept up for several hours. A large quantity of ozone was thus obtained. P. Thénard publishes a method of measuring the ozone produced by determining the amount of arsenious acid that it is able to convert into arsenic acid. This test might, perhaps, be used in comparing the results produced by various forms of ozone generators. The peroxide of hydrogen, which is also a powerful oxidizer and is likely to be of great use if any easy and cheap method of preparation can be discovered, does not convert arsenious into arsenic acid, and hence there is a readily noticed distinction between them.

H. Struve has noticed that, when freshly precipitated carbonate of barium is exposed to a low red heat, a small quantity of peroxide of barium is formed, which, on being treated with water and carbonic acid, forms peroxide of hydrogen.

In the manufacture of aniline dyes, we are glad to notice that, although it is still impossible to produce aniline red on a large scale without arsenic, this disadvantage is partially overcome by preparing some of the colors directly, which can be accomplished without arsenic, instead of making them from the aniline red which seems necessarily to contain arsenic. W. F. Gintle has found cheap aniline dyes adulterated with sugar, which he detects with a lens, the color and shape of the crystal being sufficient to distinguish them.

Under the general head of sugars, we find Casamajor recommending the use of subacetate of lead in place of bone black for obtaining colorless solutions to be used for polarimetric analysis. The manufacture of starch sugar, free from gum, for the preparation of spirit coloring, is accomplished in the usual manner, boiling with sulphuric acid; but the boiling is continued 5 to 8 hours after the liquid has ceased to show starch reactions with iodine, or till a portion of the liquid remains clear when mixed with one sixth volume of 96 per cent alcohol. For beer and liquors not stronger than 30 to 50 per cent, commercial starch sugar will answer. It is first heated until it begins to burn, and one fiftieth its weight of carbonate of ammonia stirred in.

Bone black ignited in a current of hydrogen possesses equal decolorizing power with the ordinary charcoal, so that this power cannot be due to condensed oxygen in the pores.

Another new anæsthetic has been discovered, to which Romensky gives the name of trichlor-hydrin, $C_3H_5Cl_3$. It occupies an intermediate place between chloroform and chloral, as it can be either inhaled or given by the stomach. Its action when inhaled is slower than that of chloroform, and given in the stomach, it produces gastro-intestinal irritation.

Carefully conducted experiments with *phénol* (carbolic acid) continue to sustain its well merited rank of queen of the disinfectants. Its physiological actions were found to be similar to those of strychnin.

The crude ammonia salts resulting from the purification of coal gas are frequently found to contain sulphocyanates which render them unfit for manure. In some cases, the amount of sulphocyanate of ammonia present was sufficient to destrop the crops where it was applied.

M. Gorceix has directed his attention to the gases given off by Vesuvius and other volcanoes. Analyses show that the composition varies daily, most of it being carbonic acid mixed with a little sulphuretted hydrogen.

The phosphorus in iron ores, which is highly injurious, may not only be removed so as to render the iron fit to smelt for pig iron, but can itself be utilized, according to Jacobi, by treating the ore with a solution of sulphurous acid. The insoluble basic phosphates are converted into soluble acid phosphates, which are precipitated by lime, and used for fertilizing or other purposes.

The experiments of Weiske-Proskau and Wildt have contradicted the former supposition that considerable quantities of earthy phosphates mixed with the food were deposited in the bones.

Transparent stereoscopic pictures can now be made on well sized albuminized paper, sensitized as usual, but laid for exposure with the side not made sensitive and not albuminized on the negative. Print rather strongly and tone as usual, the tone being judged of by the transparency.

Several new methods for concentrating sulphuric acid have been proposed. Carlier recommends passing steam of three atmospheres pressure through leaden worms lying at the bottom of wooden tubes lined with lead inside, and filled with acid of sp. gr. 1·5 which, as soon as its gravity has risen to 1·7, is transferred into another wooden tank of the same kind.

We have thus given a few of the topics of interest that have attracted more than usual notice during the year, and the reader will see that our statement made at the outset, that, while no startling discovery has been made, the progress in past discoveries has been important and useful, is justified.

A GIGANTIC FIRE ENGINE.

The city of New York, occupying as it does the narrow tongue of land washed on one side by the Hudson and on the other by the East river, may be said to stand in the very midst of water; but, strange to say, this most abundant supply is rarely made use of for the extinguishment of fires. We fill our fire engines with water brought in pipes from a lake distant some forty miles from the city—a source which is always liable to be cut off or diminished at the moment of greatest necessity.

The idea of employing stationary engines located near the rivers, for the purpose of sending strong streams of salt water through the city, for use in the event of fire, has been frequently suggested by prominent engineers, but has never been carried out. We are pleased to notice, however, that an experimental beginning is about to be made, the success of which may have an important influence in the improvement of our fire department.

Messrs. A. S. Cameron & Co., the well known steam pump builders, in East 23d street, this city, have lately obtained permission from the municipal authorities to lay a six inch water pipe from their factory to the river, for the purpose of drawing salt water, for use in case of fire. They are placing a large Special steam pump in their works, fitted with discharge pipes, and have so arranged them as to command not only their own building, but also those adjacent, including the Corporation yard. The pump is intended exclusively for fire purposes, and will be of the capacity of about three first class city fire engines. This great pump will be supplied with water from the river as stated.

The work is being done entirely at the expense of Messrs. Cameron, and it will furnish an example of the availability and advantage of salt water for protection against fire in this city. The extensive business of Messrs. Cameron requires them to have a pressure of steam, and watchmen on hand at all times, so that the great pump can be put in operation at a moment's notice.

Steam versus Fire.

The following facts, clipped from the *Boston Advertiser*, are from the report made to an insurance company over twenty years ago, on the application of steam to the extinguishment of fires. Steam possesses decided advantages over water, as it is not so liable to injure goods or furniture, while it can penetrate to places which a stream could not be made to reach.

The experiments were made in a large mill, through which suitable pipes and connections had been laid, communicating with the different rooms. A box of waste cotton was ignited in the second story, making a fierce blaze. Steam was turned on, filling first the upper stories and finally reaching and completely extinguishing the blaze. After trying this experiment with dry cotton several times, lamps were lighted and placed in various positions on the stairs and floor, with the wicks very high, producing strong flames. It was remarked that each lamp, as the steam reached it, was immediately put out.

Steam, it was shown, can be let into any and every part of the mill in much less time than water could be under the best arranged water mills. In case of fire, the steam is attached to or upon every surface in all positions, and will follow fire into every recess, hole, or crack. It will, in fact, precede the flames, and, covering everything in its course with water, prevent their spread.

THE new scheme for a network of tramways, proposed by an American company for the city of Berlin and its environs, has been sanctioned by the Minister of Public Works, by a concession. It comprises an encircling line round the ancient *enceinte* of the town, with various suburban routes branching out therefrom, to the number of nine. But, singularly enough, not one of these lines is prolonged into the center of the city; and it is considered that, short of their extension to a common center in the heart of the city, the full benefit of the system can hardly be realized.