THE SAVINGS OF SCIENCE.

Doubtless many of our readers have perused Dickens' excellent novel "Our Mutual Friend," and hence are, in a measure, familiar with the London dust heaps. Perhaps it will be remembered how the great writer describes their contents, and, in his inimitable style, sketches the queer people who often spend their lives among them in seeking for treasures. Those patient searchers are creations of the past, Their toilsome occupation is gone; for Science, with her inventions and processes, has extended her sway even to the worthless dust heaps, and from the filthy waste brings out the shining gold. The ordinary waste of a single household may be roughly estimated at a barrelful per day, and London, it is said, contains five hundred thousand houses. Hence, the reader may form some idea of the wonderful ingenuity which contrives to utilize the enormous aggregate of one hundred and eighty million barrels of refuse in the course of a single year.

The local authorities of London sell the privilege of removing dust and garbage from each district to a contractor, who carts it away to a large yard in the suburbs. There hill women, sieve in hand, separate the mass, by a rude analysis, into component portions. The most valuable of the latter are the waste pieces of coal, and the *breeze* or coal dust and half burnt ashes. The amount of waste of the latter may be measured by the fact, that, after selling the larger pieces to the poor, the refuse *breeze* is sufficient to bake the bricks that are rebuilding London. The material is used by the contractors who generally combine the builder's trade with their regular calling, for the purpose of imbedding the newly made bricks into compact squares. The coal dust having been fired, the mass burns with slow combustion for two or three weeks, aided by the circulation of air which is kept up by the method of stacking. The other constituents of the dust heap are separated by the sifters with the utmost rapidity: bones, rags, paper, old iron, glass, and broken crockery, and even bread, as they are eliminated from the mass being piled in separate heaps. The bones are put to a score of different uses. Of the several tuns of bones that are picked out of the dust in the course of a week, some go immediately to the boiling houses, where every portion of fat and gelatin they can yield is extracted; the former substance is bought by the soapmaker, the latter is utilized to make the patent preparations employed in cookery, photography, etc The larger bones are used by the turners and are converted into hundreds of knick-knacks, so that the bone you may have picked at dinner again enters your mouth, after many changes, as a toothpick or toothbrush, while the smaller pieces, for aught you know, have been calcined, and form the very charcoal toothpowder on your toilet table. Fragments that cannot otherwise be employed are ground very fine, and treated with sulphuric acid, constituting an excellent artificial fertilizer. Bone dust is also sometimes used by bakers for purposes of adulteration, so that the poetical remark of the giant in the fairy tale,

"I'll grind his bones to make my bread,"

is fulfilled both figuratively and literally. Another important product extracted from bones is phosphorus, for which there are an endless number of uses; and, finally, the fat that is saved in the process of boiling, is employed to make the commoner kinds of soap.

Scraps of paper abound in the dust heaps. These are all carefully sorted, the white from the colored and the printed. The soiled pieces, which cannot be profitably remanufactured, are used to make *papier maché* ornaments, dolls' heads, etc.; the clean paper is returned to the mill, and even the printed paper has the ink discharged from it, and goes again into circulation. Old rags, of course, are valuable to the paper maker, although the discovery of other materials renders this form of waste not quite so important as formerly. Greasy dish cloths cannot go to the mills again, so they are sent to the hop grower, to whom they are valuable as fertilizers. Woolen rags, if they happen to be dyed scarlet, are treated for the recovery of their cochineal, which is used as a dyeing material; and other valuable colored rags are ground up to make flock paper.

The great markets for all old woolen fabrics in England is the town of Batley and its neighborhood, in Yorkshire, the great shoddy metropolis. A writer says, regarding this manufacture: "Reduced to filaments and greasy pulp, by mighty toothed cylinders, the much vexed fabric re-enters life in the most brilliant forms, from the solid pilot cloth to silky mohairs and glossiest tweeds."

Cotton and woolen rags are both valuable when separate, but of late years it has been the custom to weave the cotton and woolen together, the warp being made of the latter material and the weft of the former; thus mixed, however, the fabric cannot be converted into paper or cloth. Many endeavors have been made to effect a separation, and at present the rags are placed in a closed receiver and subjected to steam at a very high temperature. The result is that the cotton comes out pure and fit for the paper maker; the wool is reduced to a dark brown powder, known as the ulmate of ammonia, and is employed to enrich manures which are poor in nitrogen.

A very important constituent of the dust heap is the old iron, battered saucepans, old pails, rusty hoops, horseshoes, and nails from the road. All soldered articles have the solder extracted from them, as it is more valuable than the iron, and the cheaper metal is then melted. The horseshoe nails are not mixed with the common cast iron, as they are much sought after by gunmakers for the purpose of making stub twist barrels. Scraps of iron, it is found, may be made very useful in securing the copper in the streams washing veins of copper pyrites. Pieces of battered iron are placed in tanks, into which these are collected; the copper quickly incrusts the iron, and in process of time entirely dissolves it, so that a mass of copper takes the place of the iron. The residuum, in the shape of a colored deposit, is at times taken out, dried, and smelted.

The savings of science, however, are not all made in the dust heaps of London, though in the brief outline we have given, of the mode of utilizing some of the constituents of the waste of the great city, a vast economy is indicated. A singular and recent French discovery is that sheep draw a considerable quantity of potash from the land on which they graze, much of which is ultimately excreted from the skin with the sweat. It was pointed out by Chevreul that this peculiar potash compound (*suint*) forms no less than one third of the weight of raw merino wool, while of ordinary wools it constitutes about 15 per cent of the weight of fresh fleece. As the *suint* may be extracted by mere immersion in cold water, it is easy for the manufacturers to produce more or less concentrated solutions from which the potash may be recovered by appropriate treatment. The development of this new industry is principally due to MM. Maumène and Rogelet, and their process consists in evaporating the solutions, which are sent to them, until a perfectly dry and somewhat charred residue has been obtained. This is placed in retorts and distilled very much in the same manner as coal at gas works, and the result is that, while much gas is evolved which can be used for illuminating the factory, and much ammonia is expelled which can be collected and utilized in many ways, there remains a residue which chiefly consists of carbonate, sulphate, and chloride of potassium. These three salts are separated by the usual method, and then pass into commerce. Curiously enough, they are remarkably free from soda.

The wool manufacturers of Rheims, Elbœuf, and Fourmies annually wash the fleece of 6,750,000 sheep, and the amount of potash, reckoned as carbonate, which these fleeces would yield if all were subjected to the new process, represents a value of $400,000. The by-products of gas works are so valuable now that factories are actually set up beside such establishments for their utilization. The most important is alum, which, like sal ammoniac, once came, at a great cost, from Egypt, but is now mainly procured from an aluminous shale, which forms the roofs of coal mines, and which has to be brought to the surface before the coal can be gained. This was for a long time a perfectly refuse material, covering acres of ground, like the scoriæ and cinder heaps; but chemistry has found it out, and now obtains the product by setting fire to the shale, the carbon and sulphur which it contains being sufficient for the purpose. The friable porous residua are afterwards heated in iron pans with sulphuric acid, to which is added the ammonia from the gas liquor, and the three bodies combine with water to make common or ammoniacal alum.

Nearly every article of the toilet bottle or the *sachet* is made from waste, sometimes from foully odorous matters. A peculiar fetid oil, termed fusel oil, is formed in making brandy and whisky. This fusel oil, distilled with sulphuric acid and acetate of potash, gives the oil of pears. The oil of apples is made from the same fusel oil by distillation with sulphuric acid and bichromate of potash. The oil of pineapples is obtained from the product of the action of putrid cheese on sugar, or by making a soap with butter and distilling it with alcohol and sulphuric acid. Oil of grapes and oil of cognac, used to impart the flavor of French cognac to common brandy, are little else than fusel oil. The artificial oil of bitter almonds is prepared by the action of nitric acid on the fetid oils of gas tar. The wintergreen oil of New Jersey is artificially made from willows and a body procured from a distillation of wood.

Dyes, like perfumes, are often derived from the most repulsive sources. The waste heaps of spent madder were formerly a great nuisance. It is now found that this hitherto waste can be used, and at least one third can be saved by treating it with hot acid. Prussian blue is made from pieces of horse hoofs or refuse woolen material by fusion with iron and alkali.

Perhaps the most important refuse product that can be mentioned, as proceeding from a systematic manufacturing process, is that known as soda waste. Large quantities of this substance are rejected as useless by most alkali works, and it has been, for many years, a problem and a reproach to chemistry. It is a great loss; and, if we can but recover it, no small victory will be achieved.

Dry Plate Photography with Gelatin.

Place seven grains of Nelson's gelatin and seven grains of isinglass in cold water for several hours until soft and swollen; then drain off the water, and put them into a two ounce bottle, which place in hot water until the gelatin and isinglass are dissolved. Add thirteen grains of bromide of potassium, dissolved in a dram of distilled water; and in another dram of distilled water dissolve fourteen grains of nitrate of silver, and add it by degrees, in the dark, shaking well between each addition. Now add half a dram of a saturated solution of nitrate of baryta, and two drops of muriatic acid. There will be a froth on the top of this emulsion from the shaking, and in order to get rid of this it may be strained through muslin; or, if left in the hot water, it will gradually subside.

This will form sufficient emulsion, at a cost of about twopence, to coat over one dozen quarter plates, which, as coated, should be laid on a flat surface until the film sets, which will take about five or ten minutes, when they can be put away in a box to dry. The drying will take about forty-eight hours (unless they are placed in a current of dry air), or they may be exposed at once. An exposure of thirty seconds, with alkaline developer, should give a negative of sufficient printing density without any intensifying. The plates should be placed in cold water for about a minute previous to developing.

Emulsions prepared with the silver in excess caused the plates almost surely to fog, and the image to be very thin and faint.—*Br. Jour. of Photo.*

The Tricks of Magic.

Professor Hartz, the magician, has lately been giving a series of performance here, some of which are as surprising as they are entertaining and amusing. One of them is as follows: A common empty packing box, with a lid hung by iron hinges, is placed upon the stage, and a committee from the audience asked to examine it. They report that it is a firmly made packing box. After a thorough examination, outside and inside, they take a rope and tie it up, passing twice around the ends and sides, passing it through the staples for the two padlocks, and then tie the ends firmly, and seal them with sealing wax. They then envelop the box in a canvas, which covers all six sides, when another rope is added, tied and sealed. Surely the box is safe from any attempt to get into or out of it without removing the ropes!

Professor Hartz's assistant then comes forward with a canvas sack, open at one end. This is examined by the committee and by the audience. It is then placed over the head of the assistant, and tied below his feet and the knots sealed. He is then laid on the box, and the box surrounded by a screen. In two and a half minutes the sack is thrown over the screen, the knot and seals untouched. The screen is instantly removed, and the committee, after examining the seals and finding them unbroken, commence untying the ropes and removing the canvas. The box is opened and the man found inside!

Reward Offered for Improved Cattle Cars.

The Committee of the Royal Society for the Prevention of Cruelty to Animals, London, in order, if possible, to mitigate the cruelty to which animals are subjected in railway carriages during their transit from place to place, offer a premium of $500 for a new cattle truck; also a premium of $500 for alterations of, or additions to, cattle trucks at present in use; also an additional premium of $500 to each prizeholder, so soon as he shall have induced a railway company to build fifty of his improved trucks, and to bring the same into actual use on their line for the transport of cattle.

The other conditions are that the improved truck shall be suitable in gage, dimensions, construction, material, etc., for the same purposes for which cattle trucks are now used; the truck shall be roofed, and provided with springs, buffers, and axle springs, or other appliances to prevent injuries to animals during shuntings and sudden startings and stoppages. The truck shall be provided with appointments for the supply of food and water to animals in the carriage during the time when the train is in motion or when it is stationary at a platform or siding, so as to avoid the necessity of removing the animals from the truck for refreshment; the cost of the truck shall not be greatly in excess of the cost of cattle trucks now in use; and the truck shall be satisfactory to the judges.

The limit of competition is for December 1, 1873, and unless the time is extended, American inventors will not be able to compete. But the publication of the offered reward will be of interest as showing a special call for improvements.

Rheumatism.

A correspondent in the *English Mechanic* gives the following remedy for curing rheumatic gout, of which he had long been a sufferer. He insulated his bedstead from the floor, by placing underneath each post a broken-off bottom of a glass bottle. He says the effect was magical, that he had not been free from rheumatic gout for fifteen years, and that he began to improve immediately after the application of the insulators. We are reminded, by this paragraph from our English contemporary, of a patent obtained through this office for a physician some twelve or more years ago, which created considerable interest at the time. The patent consisted in placing glass cups under the bedposts in similar manner to the above. The patentee claimed to have effected some remarkable cures by the use of his glass insulators, but we have not heard from him for some time. We cannot vouch for any merit in the idea, but it is one easily tried; and as no harm can arise from the experiment, we hope some one will test it and give us the result of his experience.

Tongueless Speech.

The reputed miracle wrought in the case of the African Bishops and certain other Christian martyrs, who retained the power of speech after having their tongues cut out, has lately been the subject of a somewhat heated controversy. The fact of their being able to speak after they had lost their tongues was not questioned; it was only claimed that there was no miracle in the matter, or anything to warrant the inference of Divine interposition because of their peculiar sanctity. They may have been most worthy characters, but their tongueless speech was no proof of such a fact, since the same phenomenon had been observed where there could be no claim to saintliness.

An interesting illustration of the truth of the latter position has just occurred in the Royal Free Hospital in London, the case being reported in the *Lancet* for November 8. To remove a cancerous ulcer, a patient's tongue was wholly cut out, leaving the floor of the mouth entire. Recovery was rapid, and within a week the patient could speak with sufficient distinctness of articulation to make himself understood, saying: "I feel easy," and "I should like some more beef tea."

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