WEALTH MADE BY CHEMISTS

Many Important Uses Found for the By-Products Formerly Wasted.

SAMPLE INSTANCES OF MODERN THRIFT

Products Taken from Coal Tar, Crude Oil and Other Substances—The Expert Chemist in the Industrial World.

The expert chemist is an important figure in the industrial world today. He can earn not only fame, but also a large income, and he saves manufacturers many millions of dollars every year.

Of course, nine out of ten chemists stick to the old routine, relates the New York Sun, but the tenth goes in for industrial chemistry and either allies himself to some progressive and flourishing manufacturer or independently conducts his industrial experiments and spends his time and brains in devising schemes for the utilization of by-products.

One doesn't talk much about waste products now. So little is wasted that it doesn't deserve mention. The Chicago joke that the packing houses utilize everything about the pigs save their squeals and are planning to make the squeals into whistles has more point than most Chicago jokes.

Probably the great slaughter houses furnish the most familiar illustration of the modern thrift in the utilization of what was formerly considered waste, and even the smaller abattoirs, while they haven't attained the scientific perfection of the western packing houses, are reformed characters.

It was only a few years ago that the abattoir was usually built upon the bank of a stream and all refuse was washed into the stream. In course of time neighbors were inconsiderate enough to protest against the practice. Sanitary bees invaded innumerable bonnets and a howl of protest went up against the abattoirs. It was necessary to dispose of the refuse in some fashion. Chemists were called in.

Methods for drying the refuse and extracting all the grease were developed. The grease went into the manufacture of soap. The residue was converted into fertilizer. After jelly had been made from the hoofs the hoofs and horns were used for buttons, knife handles, etc. The health of the neighborhood and the income of the slaughter men went up.

The Aniline Industry.

The development of the tremendous aniline color industry is altogether due to chemical experiment with waste product. In the dry distillation of coal or wood for gas the gas passes through a succession of washers, which take out its impurities. These impurities, including ammonia, carbolic acid, acetic acid and various nitrogen compounds, were formerly waste, but are now separated and used. In fact, nearly all of the acetic acid in the market is secured from the dry distillation of wood.

Five per cent of the coal used in gas manufacture is coal tar and by experiment chemists found that this coal tar, always regarded as waste residue, contained substances useful in the making of dyes. Fully 10 per cent of the weight of the coal tar is available for this purpose and upon the basis of this discovery the enormous coal tar industry has grown.

New plants have been put into many of the coke regions to collect the coal tar liberated in coke manufacture and it will not be long before the open coke oven will be a thing of the past. Where coal is burned in an open oven no coal tar can be collected and large profits are literally thrown away, but by burning the coal in closed retorts all the coal tar can be recovered and used.

This color industry, which chemists call the greatest of the modern chemical industries, has called for other chemical developments. It demands large quantities of sulphuric acid, of soda, etc., and chemists have sharpened their wits upon the problem of obtaining these products at a minimum expense.

Until recently the greater part of the sulphur used in this country was imported from Sicily. Now, through chemical processes, the sulphur contained in gold, silver and zinc is liberated and burned to sulphur dioxide, from which almost all of our sulphuric acid is made.

Low Grade Ores Made Profitable.

In connection with all of our mining development chemistry has played an important part. Ores can be mined with profit today that would have been practically worthless a few years ago. In the old mining days only high grade ore was profitable and only a certain percentage of the gold contained in the ore was freed.

The tailings thrown aside held a considerable quantity of gold, but could not be worked by the ordinary processes, so were piled mountain high and disregarded until chemists discovered that the gold was soluble in potassium cyanide and that by washing in a very weak solution of potassium cyanide the tailing gold could be profitably separated from the refuse. The same process has led to the working of low grade ores, running $4 or $5 to the ton, which could not be profitably worked by the ordinary mining processes.

The silver contained in lead has also been freed and utilized. It was found by chemists that when the melted lead was mixed with zinc the silver formed an alloy with the zinc and floated to the surface. When this mass was taken from the lead and heated in a retort the zinc, being volatile, was freed and left a deposit so rich in silver that it was easily purified.

The applications of chemistry to mining processes are legion, but it is in other branches of industry that practical chemistry is now making its strides. The Standard Oil company is a hardy exponent of the merits of industrial chemistry and has expert chemists constantly employed. As for that matter, so have all the great gas plants, coke plants, sugar refineries, starch factories, etc.

Oil Products.

The original waste of the oil business was enormous; now it is next to nothing. Of course the primary aim is the production of kerosene, but crude oil contains, on the one side, oils lighter than kerosene, such as gasoline, naphtha, and, on the other side, products much heavier than kerosene, such as paraffin. At one time all of these by-products were waste, now every one of them is utilized.

By first distillation the lighter oils are freed and collected. Then the kerosene is distilled, leaving a product that is worked over into hard paraffin and soft paraffin or vaseline. A heavy oil left after the collecting of the paraffin is used for lubricating and fuel oil, much of it being made into car and axle grease. After all these processes a solid mass of carbon is left in the retorts and this is used to a considerable extent in making carbon sticks for electric light.

When one considers that until a few years ago every one of these products save kerosine was absolutely waste one can realize to some extent the place chemistry is taking in the industrial world.

The dairy business is one of the industries with which the chemist is busying himself, and the results so far have been most satisfactory, although a much broader field for the use of casein is prophesied. The large creameries, having turned out their cream and butter, were confronted by great quantities of skim milk for which there was apparently no use. Skim milk was a drug on the market, and in many cases was drained off into neighboring streams.

The chemist stepped in and changed all that. The milk is curdled with alkali and a dried product produced which is soluble in water. The casein has been used for paper sizing, kalsomining, etc., and successful experiments have been made with it in the manufacture of artificial foods. Moistened with water to a gelatinous consistency, put under a hydraulic press and then washed in acid, it forms a hard and indissoluble substance, of which buttons and similar articles are made. Chemists say that the casein powder, which is like a fine tasteless flour, may be substituted for milk in cooking, and has a great future in this respect.

Saving in Sugar-Making.

Chemistry applied to the sugar industry has been invaluable; and, particularly in connection with the beet sugar manufacture, has recently effected a wonderful saving. The waste in the making of beet sugar was at first enormous, because the molasses was absolute waste. It contains products from the beet roots which give it a very bitter taste, and is also rich in an alkali which spoils its flavor. So, although more than one-half of the weight of the molasses was sugar, it was unavailable save for fermentation and alcohol.

Experiment proved that dry lime, mixed with the molasses, combined with the sugar, formed a product insoluble in water. Washing the molasses would then separate this product from all the other elements. The lime and sugar product being heated with carbonic acid, formed an indissoluble product, and leaving the sugar free to be easily separated. By this process today 90 per cent of the sugar is recovered from beet molasses and there is practically no molasses in the beet sugar factories.

In the manufacture of cane sugar the molasses is about as valuable as the amount of sugar contained in it would be, so there is no use for the process adopted in beet sugar making, but there is less weight of sugar in the molasses than there was formerly. This fact and the fact that the molasses is now made in vacuum pans and cannot be burned or thickened as it was in the old-fashioned open pans, accounts for the fact that there is no more black molasses and no more black gingerbread such as mother used to make.

The glucose manufacturers have called in chemists and found a new source of profit. The corn grain has, in addition to its starch product, a tiny germ in which lies its life principle. This germ was formerly crushed with the starch, separated and thrown aside as waste. Very lately it has been shown that this germ is rich in oil which can be utilized. The germ is now separated from the starch and crushed. The oil gathered finds a ready market and within the last five years millions of dollars' worth of this oil has been exported to Europe, where all corn products are in great demand. After the oil is taken from the germ the gluten left in the cake is used for varnish and the residue is used for cattle food.

The cornstalk also is ground and used for cattle food, but first the pith of the stalk is extracted and used for the lining of vessels, the theory being that if a fissure occurs in the framework of the vessel the pith lining, becoming wet, will swell and to some extent close the fissure.

A Lift for the South.

The cottonseed oil industry has eliminated its waste almost entirely, although twenty years ago every part of the cottonseed save the oil was waste product. In the cottonseed oil factory now the seed is collected after coming through the cotton gin, and is first stripped of its lint, which is used in the manufacture of certain kinds of paper, felts, etc. Next the shell of the seed is removed and either ground for cattle food or used for fuel. In the latter case the ashes are collected for potash.

The kernel of the seed is ground and pressed to extract the oil and the residue is used for cattle food. The oil in process of refining gives off a waste which enters into soap making and the making of oleomargarine.

Glycerine, used in such great quantities at present, was for years a waste product. All waste from fatty oils contains compounds of an acid with glycerine. The acid will combine with an alkali, leaving the glycerine in a watery solution, from which it is collected by evaporation and distillation. Immense quantities of this reclaimed waste product are used in the making of explosives.

When steel is melted in a Bessemer converter the phosphorus, which used to be a nuisance, is separated from the steel by the introduction of lime, with which the phosphorus combines readily. This phosphorus is then used as a fertilizer.

The slag from iron furnaces is converted into cement.

The tin is taken from old tin cans by chemical process and is used over and over again.

Even the acids used for chemical purposes are not allowed to outlive their usefulness with the accomplishment of their purpose. The Standard Oil company formerly wasted great quantities of sulphuric acid after it had been used to remove the impurities from the oil. The acid was drained off into the river. Now it is used in a fertilizer particularly adapted to soil where phosphate rock must be dissolved.

Then again, in a certain great galvanizing works the iron was cleaned with sulphuric acid, which was then run into the nearest river. This method of disposing of the waste was forbidden. Chemists were consulted. The solution was made stronger so that it could be clarified and used repeatedly. Finally, when it could no longer be used for washing, it was evaporated and the sulphate of iron extracted from it. This by-product proved so valuable that it is now the chief product of the works.

From the waste product of the wine industry chemists now obtain a crude cream of tartar, which, refined to a high degree, constitutes the acid principles of the best forms of baking powder.

The list might be protracted indefinitely and there seems to be in the industrial world today no product so utterly worthless that it may not at least find profitable incarnation in cattle food, fertilizer or glue.

SOMEWHAT DIFFERENT.

First Manager (describing new play)—At the conclusion of the third act there were loud calls for the author.

Second Manager (interrupting)—Author or authorities.

BIGGEST SHIPS IN THE WORLD.

Freight-Carrying Steamships for the Great Northern Road.

When the two enormous ships now being built for the Great Northern Railroad company are turned over to that company, says the Brooklyn Eagle, it will possess the two largest freight carrying steamships now afloat. Each of them is nearly two and a half blocks long. If placed in the average city street one of these big ships would fill it so that there would barely be room for men to pass by, while the officers on the bridge of the ship would be able to look into the sixth or seventh story windows of a skyscraper.

It will probably be two years before either of the two ships will approach completion, and it is likely to be two years and a half before they can be launched. Eight hundred men are working in the yards of the Eastern Ship Building company, opposite New London, Conn., and practically the whole force is being concentrated on the work of building the two big freighters. The keels have already been laid and some of the center frames have been placed in position. To the uninitiated there is little to indicate that two vast ships are being built, for the preliminary scaffolding looks like that used in building a house.

Nearly as much freight as could be stored in three big city warehouses can go in the holds of each of these two big ships. The actual dimensions of the vessels are: Length, 630 feet; width, 73 feet; depth, 56 feet. Each will have a displacement of 33,000 tons. The biggest passenger steamship now afloat is the Oceanic of the White Star line. The dimensions of the Oceanic are: Length, 704 feet; width, 68 feet; depth, 49 feet; displacement, 28,500 tons. From these figures it can be seen that while the Oceanic is longer than either of the two mammoth freighters building at New London, the Great Northern's boats have, nevertheless, a greater displacement. The displacement of a freight steamship is, as a rule, a reliable indication of the ship's cargo carrying capacity and the new boats, therefore, will each have a greater carrying space than the Oceanic, even if that vessel were fitted for transporting freight instead of passengers.

There will be no place for fripperies on the new ships. Each will be about as handsome as a mud scow, but as useful as a pin. There will be no accommodation for passengers, if the original plans are carried out, although it is possible that, later, as is the case with many of the big English freighters, enough cabins will be built to accommodate a dozen or so select travelers. The ships of the Glen line, for instance, are nominally cargo boats, but they have excellent passenger accommodations beside and are able to obtain higher prices for passage to China than even the regular passenger steamships.

Each of the Great Northern's freighters will have four masts, but these masts will carry powerful derricks instead of sails. There will be some sails carried aboard these ships, as there are on the transatlantic steamships, but it is very seldom nowadays that a big steamship has to hoist a sail. If there is an utter breakdown of all the engines the accident usually occurs in one of the regular steamship lanes, which are as well traversed as a country street. A broken down steamship, therefore, will have its choice of tows or of waiting time with sails. Usually it will take a tow. Ships' masts in these days are used as derricks, as signal posts and for the display of lights at night; in fact, for everything except sails.

It is the intention of the Great Northern Railroad company to make these two big freight steamships not only the largest, but the swiftest cargo carriers in the world. They will be furnished with twin screws and will have triple expansion engines almost as powerful and swift as those vessels designed entirely for speed. The engines of the Deutschland of the North German Lloyd company yield 35,640 horse power and it is probable that the engines to be built for the Great Northern's boats will be almost as powerful. The speed of these passenger ships is a shade better than twenty-two knots an hour and it is the hope of the designers of the new big freighters to approach the speed of the transatlantic steamships as nearly as the difference of construction will allow.

The demand at present is for freight steamships of great carrying capacity and of high speed. The freight rates charged by the swift passenger steamships which cross the Atlantic and Pacific are very high, but the prices are gladly paid by merchants who want their goods in a hurry. The company which is building these big ships is making no experiment. It is merely meeting what it considers to be a well-marked demand for bigger boats and higher speed.

Reflections of a Bachelor.

New York Press: The way to get out with a girl is to get in with her mother.

Love is like fruit—you have to throw it away when it is overripe.

The more sisters a man has the less he knows about other men's sisters or his own.

When a girl shows a man's photograph around it's a sign he isn't the picture she is wearing where nobody can see it.

The way men will always run after red-headed women reminds one of the way donkeys will always run after a bunch of carrots.

PATHFINDER'S NEGLECTED GRAVE.

Resting Place of General John C. Fremont Uncared For.

That "republics are ungrateful" seems to be borne out by the case of General John C. Fremont, whose deeds have been almost forgotten by the present generation. The great work of the "Pathfinder" has been ignored entirely, if one may judge by the fact that on his grave there is not even a stone to indicate the resting place of a man whom foreign nations delighted to honor for the important work he had done.

All that remains of the man who opened a way over the Rocky mountains, who suffered great privation and almost lost his life for the benefit of his fellowman, is now resting in Rockland cemetery, in the lower part of Rockland county, reports the New York Mail and Express. The body of General Fremont might just as well be in any ordinary pasture lot as where it is, so far as any distinguishing marks are concerned. His grave is overgrown with grasses and weeds and only the men employed regularly in the cemetery are able to find the grave of a man whose reports of explorations in this country stirred the whole civilized world.

Rockland cemetery is in Sparkill and runs up to one of the highest points along the historic Hudson river. The highest point was selected for General Fremont's grave. From this spot is afforded a view for many miles around. To the west one may look over the better part of Rockland county and see the Ramapo mountains; to the north the mountains that line the west shore of the Hudson; to the south the Palisades and to the east the hills of Westchester county, with Long Island sound beyond. On a clear day it is possible to see across Long Island and get a view of the sea.

When the body of General Fremont was taken to Rockland cemetery there was much talk of erecting a suitable monument to mark the spot where he was buried. Subsequently an effort was made to erect such a monument, but it never got beyond supplying a base for a shaft. The base was put in position and for a year or so means were furnished to keep the grave in order. Then interest in the movement lagged and there was an end to it.

For several years nothing has been done with the grave. Weeds and wild grasses have grown over it until all trace of the original grave has disappeared. One man, acting as the representative of a Grand Army post here, saw that the grave was properly decorated with flowers on Memorial day, much to the surprise of the cemetery attendants.

General Fremont began his career in the service of his country as a teacher of mathematics on the sloop-of-war Natchez and went from there to the post of teacher of mathematics on the frigate Independence in 1835. President Van Buren appointed him a second lieutenant in the corps of topographical engineers. In 1842 he explored the south pass of the Rocky mountains and did it with only a handful of men. In doing that he demonstrated the feasibility of overland communication between the two sides of the continent and opened the route to California. That feat commanded attention both at home and abroad. He made more extensive explorations later and in order to save the lives of his party was compelled to push through to California. On one occasion, when caught in heavy snows that baffled the Indian guides, the party was compelled to resort to cannibalism in order to keep alive. When what was left of the party reached Sacramento every man of them was nothing more than a living skeleton.

The then Captain Fremont took an active part in the Mexican war. He was elected a senator from California in 1849. A year later the king of Prussia, through Baron Humboldt, sent him a golden medal "for progress in the sciences" and he was made a member of the Geographical society of Berlin. By the Geographical society of London he was awarded a "founders' medal for pre-eminent services in promoting the cause of geographical science."

General Fremont was later nominated for president of the United States and was the first republican candidate for that office. Prior to that time he had been a whig. He was defeated by James B. Buchanan.

In 1861 General Fremont was appointed a major general by President Lincoln. He resigned from the army in 1862 and was nominated for the presidency in 1864, but withdrew from the contest.

ELECTRIC FAN EXPERIMENTS.

A Block of Ice in Front of the Wheel Produces Good Results.

"During the present hot spell," said an office man to the New Orleans Times reporter, "I have been conducting an experiment with an electric fan and I have made some rather interesting discoveries. These fans are full of mysteries, in a way, and for a long time I felt very much intimidated by the fan in my office and would almost do an Oriental salaam when I approached it in any way. But to recur to my experiment.

"The office which I occupy is rather gloomy, and, in fact, is almost as large as a hall. The fan had not been doing very good work in a cooling way, although there was a considerable amount of disturbance atmospherically in the room. The fan is a large one and of the most improved make. I put a thermometer directly in front of the fan so it would get the full benefit of the whirling member, but placed the bulb some distance from the fan. The result was surprising. Instead of forcing the fluid down, the temperature began to rise. It rose several degrees. I soon figured the problem out. Really, the fan was not cooling the office. Some parts of the office might have been cooler, but taking the whole space of the office, the same number of heat units might have been found in the room. The fan, in other words, had not forced any of the heat out. It had simply churned it up, so to speak.

"But an interesting thing had happened and this accounted for the fact that the bulb indicated an increase in the temperature of the room. The fan had banked the heat against the thermometer, created friction by its rotary motion and a greater number of heat units had been crowded into a given space and hence there had been a perceptible rise in the temperature. There had been, of course, a proportionate fall in the temperature in other sections of the room. But I made another experiment. I put a huge block of ice in front of the fan, just a few feet away. I left my thermometer hanging in the same place. In a short while the fluid began to fall in the bulb and under the influence of the cold wave that was swept from the surface of the ice the temperature fell four or five degrees and it was not long in doing it, either. It cooled the room and was one of the most successful experiments I made. The force of the fan melted the ice very rapidly. The hot air was banked against the ice just as it had been banked against the thermometer in the first case. The concentration of heat units played havoc with the ice, but the room was cooled meanwhile."

Quite the Contrary.

Chicago Tribune: "I wish you would make cautious inquiry," said the editor of the Morning Thunderbolt, "and find out whether or not there is any foundation for the story that got into our columns this morning about Colonel Biggun of Outsomehurst having served a term in the penitentiary for bigamy when he was a young man."

"I suppose it's important if true," hazarded the new reporter.

"Not at all," snorted the editor. "It's important if it isn't true."