

SULPHUR MINES.

THE *Teinturier Pratique*, at the commencement of an article on the manufacture of sulphuric acid, gives a notice of some of the principal sulphur beds in the world.

In France sulphur is only got in one mine near Apt, in Vaucluse, where the deposit is neither very extensive nor very thick. The mineral raised, a marly limestone, does not contain more than 25 per cent. of sulphur. In central Italy, near Bologna, a vein of sulphur is worked which extends over 25 kilometers in length. The ore is poor and has to be raised from a considerable depth. Almost the whole of the produce is used in sulphuring the vines.

The deposits near Rome have more scientific interest than technological importance. In Austria there are two mines of sulphur worked, one not far from Cracow and the other at Radoboi in Croatia. Both deposits are of considerable extent, but the annual yield is insignificant.

In Spain, in the province of Murcia and at other places, the existence of fine beds of sulphur has been ascertained. Two only are worked, and that not energetically. The quality is very good.

In Tripoli there is a deposit of sulphur important both for its extent and richness, but it is not worked. The same may be said of the sulphur beds along the Red Sea, near the Isthmus of Suez. They rank among the finest deposits in the world, but the want of water is a great obstacle to their utilization.

The author then passes to a description of the Sicilian mines, quite overlooking those of Iceland, which are probably ten times as rich, and which lie so much more convenient for British commerce.

An important improvement in the manufacture of sulphuric acid has been effected at Bordeaux. M. Fournet, by causing the gases from the kilns to circulate more than once in tubes fitted with coke so as to produce a homogeneous mixture, has succeeded with chamber room not exceeding 400 cubic yards in burning an average of 1,000 lbs. of sulphur, obtaining 3,000 lbs. of monohydrated acid (D. O. V.), which is almost equal to the theoretical yield.

MANUFACTURE OF ANTHRAQUINONE.

THE addition of oxidizing agents during the fusion of anthraquinone converts the sulphites generated into sulphates, and prevents the further reduction of the former sulphides which produce non-tinctorial hydro-compounds. At the same time the troublesome evolution of sulphurous acid on the subsequent addition of muriatic acid is avoided. The chrome residues from the manufacture of anthraquinone are partly utilized as chrome-alum and partly reconverted into chromic acid.

Chrome-alum may be directly converted in the cold into chromate of lead so as to produce any desired shade, yellow, orange, or red. Chloride of lime is the most suitable oxidizing agent for this purpose. Ten parts of chrome-alum ground up with 6 parts of the finest litharge, and put into 30 parts of water along with 5 parts chloride of lime—in half an hour the color is ready to be washed and dried. Ten parts of chrome-alum, 2½ hydrate of lime, 5 of litharge, and 5 chloride of lime after standing for some hours yield a fine garnet red. The yield exceeds the theoretical amount because sulphate of lead is mixed with the product. The working cost is small, and instead of chrome-alum even the crude solutions may be used. The cost of manufacture is as follows for 220 lbs.:

340 lbs. chrome-alum.....	£1 17
206 " litharge.....	2 10
171 " chloride of lime.....	1 3

£5 10

while the sale price for the same quality (?) ranges from £11 to £12. Where chrome residues occur as a waste product this is a profitable method for their utilization.—*Industrie Blatter und Zeitschrift f. d. Chem. Grossgers.*

COLORS FROM IRON TURNINGS AND FILINGS.

By R. and C. STEINAN.

THE object of this invention is to yield a product which shall be equal both in quality and in price to "English red," and to the native ochre obtained by mining in France. The first step is to prepare pure oxide of iron without the aid of acids, and by the simple action of water and atmospheric oxygen, in order to keep within the limits of price. As raw material the inventors prefer wrought-iron turnings, which expose the largest possible surface to air and water, and, by reason of their structure, allow a free passage to both.

In order to obtain peroxide free from protoxide, a so-called oxidizing chest is employed, consisting of two compartments communicating with each other and with water. In one compartment the iron borings lie upon a grating, while the other contains a movable piston. When the piston is at its lowest point the turnings are covered with water, from which they are free when it is drawn up. The piston imparts its motion to the water, forcing it through the iron when going down, and sucking it out when re-ascending. Simultaneously, the air rushes into the empty space, and exerts an oxidizing action, while the hydrated oxide, as fast as formed, is rinsed away from the iron by the descending water. After the piston has been kept in incessant action for twelve hours it is brought to a standstill, in order that the hydrated oxide may collect at the bottom of the chest. By opening a valve it is then drawn off into a conical receiver, placed beneath the oxidation chest, which is then charged with fresh water, and the process is resumed as above. The conical receiver has several depressions, in which impurities are supposed to collect. The hydrated oxide is freed from water by means of a filter press; the press cakes are dried in a drying room, and are then ready for the preparation of colors. In 24 hours the iron yields about 1½ per cent. of hydrated oxide. (A ton of borings thus treated for an entire week would yield, say, 2 cwt. of the product.)

The hydrated oxide of iron can be used directly for the preparation of a yellow, while for a red it must be previously converted into the anhydrous oxide by calcination in a furnace, but without direct exposure to the fuel or the products of combustion. Black is obtained by heating the hydrated oxide with exclusion of air, and in presence of reducing agents, such as carbon or sulphur. Brown and its modifications are formed either by partial reduction, or by mixing yellow, red and black. The inventors afterward mix chalk with the colors to bring them into a marketable state.

[*Quære*: How would a hydrated peroxide of iron thus prepared be suitable for the preparation of pernitrate and persulphate of iron, for the use of dyers and printers, the oxidation not being obtained at the expense of the acid employed?

Quære further: Whether white lead might not be advantageously prepared by a modification of this process?—Ed. *Chem. Review.*]

ON THE DENATURATION OF ALCOHOL.

UNDER this strange title is hidden a subject of great importance to the chemical arts and manufactures, and which is now attracting much attention in various parts of the Continent. Not only our own Government, but the authorities in several other countries, find it necessary to allow alcohol to be purchased for industrial purposes without the increase of price attached to it when intended as a beverage, both for fiscal reasons and in the interest of public health and morality. In England, as is well known, alcohol which is to be sold duty free for industrial purposes is mixed with ten per cent. of methyl alcohol (pyroxylic spirit and naphtha or wood-spirit), and the mixture is then known as "methylated spirits." But the wood-spirit itself appears liable to duty if only sufficiently purified, and it is very difficult for manufacturers and for scientific men to learn what is the quality which the Government will allow to be used for rendering alcohol undrinkable. The question was once put to the revenue authorities, what was the nature and what were the characters of a wood-spirit which might be imported free of duty? To this very reasonable inquiry, put for the guidance of the memorialists in important business transactions, the reply was what no one would assuredly ever have deemed possible:

"It is not in the power of the Board to define by any specific test naphtha which would be admissible free of duty as crude naphtha, while it is admittedly in the power of the manufacturer of the article to purify it sufficiently to render it liable to duty under the provisions of the law."

We cannot help here asking who on earth, in these days, save the revenue authorities, ever dreams of applying the word "naphtha" to methyl alcohol?

But with the addition of 10 per cent. of wood-spirit, which must be in some state and of some particular degree of purity, which nobody can or will define, the law is not yet contented. It is assumed that all or the most of the alcohol required for industrial purposes "might, could, would, or should" be used by the varnish makers, and, therefore, unless the consumer can give a bond for a heavy sum—if we remember rightly, £1,000—not to use or sell the liquid as a beverage, the further addition of a quantity of shellac is insisted on. It would scarcely be possible to devise an addition more detrimental to the object of the dyer, the color-maker, the manufacturer of extracts of vegetable matters, etc. We cannot, therefore, deny ourselves the mischievous pleasure of pointing out that by the addition of water the shellac is precipitated, and may then be removed by filtration, and those whose tastes are that way inclined may then drink the mixture. We fear, indeed, that no addition not containing a prompt and powerful poison would prevent people from drinking anything having the smell of spirits. A Russian popular proverb says, "There is no such a thing as bad spirits." Certainly, those who will drink absinthe may be safely trusted to drink anything, however ~~poisonous~~ or gradually injurious. It is suggested that the ingredients used for mixing with alcohol should vary according to the use for which it is intended. If it is destined to be consumed in varnish-making, shellac may, of course, do very well. But if it is to be used in the tinctorial arts, or in any of their accessories, something of a totally different nature is needed. Is it impossible to find some substance which, without altering the solvent power of the spirit, or its behavior toward colors, shall impart to it a loathsome smell or taste?

Cheap alcohol is one of the requisites of modern manufacturing chemistry as far as organic substances are concerned, and the want of it, or the tedious and harassing formalities under which alone it can be now procured, is one cause of our failure in competing with Germany in certain important branches.—*Chemical Review.*

SPROUTING OF SILVER AND ITS CAUSE.

By THEODORE FLUEGGER, Assayer St. Louis Smelting Works.

ASSAYERS and chemists all know that great care must be taken with the molten silver, obtained in assaying for fineness and quantitative determination of same in ores and furnace products, to prevent what is generally termed sprouting of the silver, which is nothing else but a disengagement of oxygen gas, absorbed by the silver while in a highly heated state, giving rise to the peculiar arborescent appearance observed on the surfaces of silver after sprouting, and endangering thereby a loss of silver. In order to obtain a reliable assay, the greatest caution is therefore necessary to prevent the sprouting, the cause of which is not generally known; but to prove that it is due to the disengagement of oxygen after the act of solidification, and not to the contraction of the outer, cooler layers, as some theorists contend, on the inner mass of metal, any one can convince himself by the following small experiment, which will, no doubt, interest many who have witnessed this remarkable behavior of the silver: 50 grammes of pure silver may be taken and placed in a common scorifier with 10 grammes of borax glass, and heated in a muffle to a white heat (over 1,000° C.) for at least half an hour. The experiment will often fail if heated in less time than above stated. After the expiration of the half hour the scorifier, with contents, can be taken out of the muffle, and placed on a brick or some other cool object. The silver can soon be seen to solidify through the clear borax glass which covers it, but the disengagement of the oxygen will not take place immediately after solidification, and varies with the degree of heat and other prevailing circumstances. Blowing and disturbing the scorifier must be avoided. The oxygen will gradually show itself by raising the soft and expansible borax glass, forming in successful experiments a large bubble about the size of a walnut. The borax glass solidifies in the shape of a small hemisphere, which contains the oxygen. The usual tests for oxygen may now be applied. A match is charred and allowed to glow, the glowing end is suddenly thrust through the thin side of the hemisphere of borax glass, breaking it and exposing to the oxygen the glowing end of the match, which will immediately burst with a bright flare into a flame, proving the presence of either oxygen or nitrous oxide gas. Binoxide of nitrogen will give the final proof of producing red flames, which are conclusive that oxygen and not nitrous oxide gas is present. To this end several of the bubbles obtained on the scorifiers in the above way were burst under water, the escaping gas allowed to ascend into a receiver, and then the binoxide of nitrogen introduced by means of a tube, connected with the generating apparatus, containing copper and dilute nitric acid. This neat experiment was first made and successfully repeated in the laboratory of the St. Louis Smelting and Refining Company.—*Engineering and Mining Journal.*

DETECTION OF COPPER.—Copper, where it is not wanted, is a very unwelcome guest, capable of doing much mischief. Its presence in liquids and soluble solids may be easily detected by the following method: Into the dilute liquid we plunge a galvanic couple, consisting of a wire of zinc and one of platinum soldered together at one end. If copper is present, it forms a blackish deposit upon the platinum. If this deposit is washed but not dried, and exposed to the fumes given off on pouring sulphuric acid upon bromide of potassium, it takes a deep violet color, which is best seen on rubbing the platinum wire upon a plate of porcelain. If the wires are left in the solution suspected for 12 hours, one part of copper can be thus detected in a million of other substances.—M. L. CRESTI, in *Deutsche Chem. Gesell.*

CHROME BLUE.—M. GASTON BONG.—The following materials are intimately mixed and strongly calcined with free access of air:

Boric acid.....	15 parts.
Alumina.....	15 "
Carbonate of magnesia.....	20 "
Chromate of baryta.....	2 "

THE fruits of the Cascalote (*Caesalpinia Cacalaco*) and the Huisache (*Acacia Albicans*) are both rich in tannin, and are used in Mexico in place of gall-nuts. Their percentage of tannin has not yet been determined. Their value on the spot is about 1¼d. per pound.

THE NATURE, ORIGIN, AND PROGRESS OF DISEASE IN THE HUMAN BODY.

By J. B. GRAVES, M. D., Corning, N. Y.

THE manner in which we propose to investigate this subject will make it necessary for us to consider the composition of the body itself. The body is composed of atoms, and these atoms are arranged according to fixed and established laws, laws that cannot be changed. They can no more be changed than the Almighty who established them can change. These laws are: First, the law of origin. Second, the law of growth or development. Third, the law of waste and repair.

The different parts of the human body are formed by some combination of atoms. The manner in which these atoms are combined determines the nature of the formation. The combination of atoms forms molecules, and molecules combined form cells; the cells thus formed are proliferated into tissue. A certain arrangement of these tissues forms an organ, and a certain arrangement of these organs thus formed constitutes the human body.

There are three different states of matter known to us, namely, solid, fluid, and gaseous. We find matter in these different states in the human body. This may be called the molecular condition of the body. Before proceeding with our inquiry, we must understand what is meant by atom, molecule, and cell. We do not use the terms atom and molecule as synonyms in this discussion. An atom is a unit. It is indivisible matter, whether solid, fluid, or gaseous. By molecule we mean some combination of atoms. To illustrate our position we will take alcohol. Alcohol is a compound made up of atoms of carbon, hydrogen, and oxygen in certain proportions—twenty-four atoms of carbon, six of hydrogen, and sixteen of oxygen. When thus united they make alcohol. No other combination of these atoms will produce alcohol.

Another illustration: Water is a compound substance made up of hydrogen and oxygen in certain proportions—two of hydrogen and sixteen of oxygen. The magnitude which we call a molecule of water consists of two magnitudes, which we call atoms of hydrogen and oxygen. The relations in which atoms stand to each other are far-reaching and intricate, and cannot be accidental.

The elementary atoms of which the body is composed have a certain number of bonds by which they are united. And by these alone can they be united for a specific purpose. The manner in which the atoms are grouped together in the molecule is important for us to understand in the prosecution of our inquiries on the subject. Every molecule is a unit in which all the atoms are joined together by their several bonds; and it becomes an object of great interest to investigate and determine the exact manner in which the molecular structure is built up. To understand the diseases of the body we must study the structure; and in order to study its structure, we must understand the structure of its molecules, as well as the atoms of which the molecule is composed. Certain atoms are united according to fixed and established laws, and when thus united they make a molecule, as in the formation of alcohol or water. Molecules thus formed, when combined in a certain manner, according to these laws, form what is called a cell. We are now speaking of normal action. The nature of the cell is determined by its composition. The cell thus formed is proliferated into tissue, and it is by this process that the different organs of the body are built up.

Now, when we come to consider what constitutes disease of the body thus formed, we are led at once to the conclusion that there must be some disturbing force that has changed the operation of these laws. This, then, brings us to the definition of disease, and we shall not define by enumerating symptoms. But we will define disease of the human body, at all times and under all circumstances, to consist in atoms out of place.

The atoms of which the body is composed cannot be changed in their nature. They are the same in substance and in nature at all times and under all circumstances. Yet an atom out of place must break down and destroy the molecule. Take a molecule of alcohol and abstract an atom of oxygen therefrom, and you will no longer have alcohol. An atom is out of place, and that destroys the molecule. The change of a molecule of a cell must result in a change of the nature of the cell, and the cell thus changed cannot be proliferated into normal tissue. Its very nature is changed; yet the laws by which it was formed are not changed. The atom is the same, and the laws that govern atoms are the same.

There is another law that steps in here and controls. It is the law of waste, or, perhaps, of decadence, I should say. The moment a molecule is changed it produces a change in the cell of which it is a part, and that cell may form a degenerated tissue, a cancer, if you please. It must continue to degenerate until it is resolved into its original atoms; and they are indivisible and indestructible. The atoms of which the molecule is composed, and the molecules of which the cell is composed, are not thrown together promiscuously, but are united by certain bonds, and the microscope reveals the fact that the atoms of which the molecule is composed are continually in motion in every