can sculptor, and had been burning twenty-four hours on the end of a joist just under his fire place. He had smelt something like a coal pit for some time, and at length perceived smoke rising from the brick floor. On going below he found the room full of smoke, and a rush bottomed chair just under the joist was partially consumed. But the joist was not yet burned off, and why? Because the fire was bricked down. It could not rise and burst into flames.

The secret of fireproof building then is this: It must be made impossible for the flames to pass through the floors or up the stairway. If you will have wood floors and stairs, lay a flooring of the thinnest sheet iron over the joists, and your wood upon that; and sheath the stairs with the same material. A floor will not burn without a supply of air under it. Throw a dry board upon a perfectly flat pavement and kindle it as it lies, if you can. You may make a fire upon it and in time consume it, but it will require a long time. Prevent drafts, and though there will still be fires no house will be consumed. The combustion will go on so slowly that discovery is certain in time to prevent any great calamity.

But the roofs, how about them? Slate or tiles? Zinc melts too easily. I believe that hard burned tiles, if flat, would stand the frost at home; and if so, they constitute the best roofing. My house has no joists. All the floors are of tiles resting on arches. One of these arches was made over a room twenty five feet square, by four men in four days. The bri ks are about one and a half inches thick, and laid edgewise with plaster of Paris. There was no framework prepared to lay them on, unless you would so term four bits of wood which a man could carry under his arm. And yet this arch is so strong as to be perfectly safe with a large dancing party on it. I never have heard of one of those floors falling, and they are absolutely fireproof. Of course light arches like these would not do for warehouses.

It would pay, I think, to send out here for an Italian brick mason who knows how to build those thin but strong arches for dwelling houses. I know that there is a prejudice at home against brick or composition floors. "Too cold in winter," it is said. And so they are if bare, but cover them with several thicknesses of paper and then carpet them, and no one can distinguish the slightest difference between their temperature and that of wood floors. Who doubts this, let him try the experiment with the feet of the thermometer. The truth is that the brick or composition floor is no colder in itself than wood—the thermometer attests this—but it is a better conductor. I do not insure my house, as I know that it is not combustible.

SODA.

One of the chemical discoveries of the present century, the applications of which are the most varied, and the history of which is the least known, is the manufacture of soda. It is a metallic oxide; that is to say, the combination of a metal with oxygen. Like potash, with which it has many affinities and many common uses, it belongs to what the Arabs called, in the ninth century, alkalies,—a name which, as well as alchemy, has been adopted in most European laboratories. It has a strong affinity for acids, and combines with them to form various salts. This property is made use of in trades of various kinds, as, for instance, in scouring cloths that must be freed from greasy matters, and also in the manufacture of soap. The white and marbled soap has not even yet lost its superiority, and still occupies a first place among similar products of other nations. It is made by combining soda with the acid fat of olive oil.

The glass manufactories also consume an immense quantity of soda. Glass is composed of flint and different alkaline bases, such as potash, soda, lime, and barytes. Certain mineral oxides give it a variety of color, sometimes of a very undesirable kind. Should the paste contain traces of iron, instead of producing white glass there will be only the common bottle glass; and if the iron be in larger proportions, the dark green shade will be the result. On the contrary, add a certain quantity of oxide of lead to a pure base of potash, and the beautiful crystal glass is formed; a still larger dose, and the diamond paste, with its wonderfully dispersive power, will deceive many an unpractised eye. Between these extremes, the dull bottle and the many sided crystal, there is the window glass, which adds so much to the comfort and health of our houses, the gorgeous looking glasses to adorn our drawing rooms, the rich decorations for the dining table, the crystal pendants of our gaseliers, and many other objects which satisfy our commonest necessities, and minister to the highest taste or luxury.

When marine salt is acted upon by sulphuric acid, an acid gas is thrown off, and sulphate of soda remains. In the time of Leblanc, chemists were ignorant of the composition of the gas which escapes, and gave it the name, for want of a better, of muriatic acid; and marine salt was supposed to be a composition of this acid and soda, which was an error. In the present day, it is known that marine salt is composed only of soda and chlorine, and that muriatic acid consists of hydrogen and chlorine. Neither Leblanc nor his companions suspected the real case, that sulphuric acid could have no power over salt without the intervention of water. It is this simple agent, which, by decomposing, furnishes oxygen for the sodium, and hydrogen for the chlorine; giving, as a result, the soda which combines with the sulphuric acid, and a gas which flies off, now called, to adopt the more exact name of the new system, hydrochloric acid. Without water there could be no reaction; happily, it was always present in the sulphuric acid that was employed, and consequently this error in theory had no influence over the result in action. We have now reached the point of obtaining sulphate of soda; to obtain the common soda, it is necessary to divide it from the sulphuric acid, which was altogether Leblanc's discovery. Most chemists proposed a solution of this difficult question by heating the sulphate with various bodies; he laid his hand upon the one which gave the best results,—chalk (carbonate of lime) and charcoal. It is singular that he did not even know the exact theory of the reaction this produces, which latter chemists have fully defined; but his instinct was so sure, his first experiments were conducted with such accuracy, and the quantities were so irreproachably defined, that later years have in no degree changed the manufacturing process which Leblanc first laid down. First came the decomposition of marine salt by sulphuric acid; then the decomposition of sulphate of soda by the heated kiln, and the washing of the rough soda on the floor of the kiln.

SULPHURIC ACID.

From the first of these operations, one of the most important articles in modern industrial occupation intervenes—that of sulphuric acid. In a few years, a way of making it in large quantities was discovered, and the face of all chemical operations was changed. It is by the help of it, that, directly or indirectly, chemists are enabled to extract from the different salts the greater part of the acids used in laboratories and in the arts. Thanks to it, hydrochloric acid has been economically obtained, which has rendered such service in paper making, bleaching, dyeing of stuffs, also serving for the preparation of gelatin, of ammoniacal salts, and of disinfectants. Next is carbonic acid, which is used in the manufacture of soda water and all effervescent drinks, in the extraction of sugar from beet root, and the fabrication of alkaline bicarbonates; and last of all is azotic acid, the most powerful agent of oxidation, which dissolves all metals, even gold and platina, when united to hydrochloric acid, and is indispensable to the workers in metals. By sulphuric acid, phosphates are transformed into powerful manures; sulphates of aluminium, of potash, of magnesia, of ammonia and of iron are economically obtained, with many other important applications in agriculture, medicine, and domestic economy. The production of electric currents, of electro-chemical gilding and plating, the refining of gold and silver, the making of stearine candles, the purification of colza and other oils, the dissolution of indigo, are some among many other branches of trade which could not be carried on without sulphuric acid; and its being manufactured in such large quantities is entirely owing to the soda works.

HYDROCHLORIC ACID.

One of the most serious embarrassments arose from the immense quantity of hydrochloric acid which was poured out from the soda works in the form of gas. It was condensed as much as possible by passing it through a series of vessels full of water, thus obtaining acid dissolutions, which had a certain value; but more was produced than could be disposed of. Besides, much e caped into the atmosphere in the shape of corrosive acid vapor, which attacked the iron parts of buildings, dried up the leaves of the trees, and exercised a most pernicious influence on the health of the surrounding neighborhood. The winds carried it away to great distances, and the effects were perceptible miles away. The proprietors had to pay heavy damages; and it became a matter of existence or non existence to the soda works to find a means of condensing and collecting this deleterious acid. All these difficulties have been surmounted; and as it has often happened in chemistry, each has become the means of fresh progress. One of the most curious plans tried to purify the air was to build the works near to old abandoned quarries, and to bury the inconvenient vapors in their depths; but the acid, penetrating the stone, rendered it moist and friable, so that portions fell, and houses built in the neighborhood were rendered unsafe. Two different arrangements are now adopted, both succeeding perfectly. One is to pass the gas through many hundreds of stone bottles, communicating with each other through well luted tubes; a current of water is driven through them in an opposite way to the gas, and the smallest portion of hydrochloric acid is thus dissolved. Another plan is what is called the absorbing cascade; a high, wide tower is built of flintstones, the interior of which is filled with coke, fragments of flint, or bricks set apart; the gas is introduced at the base, and before it can escape it has to pass through all the interstices of these hard materials. From above, a fine rain of water is continually falling, and, meeting the gas at every angle, retards its progress and absorbs the acid.—*Chambers' Journal.*

Experimental Science at Cornell.

Professor B. G. Wilder, Professor of Comparative Anatomy and Zoology, at Cornell University, Ithaca, N. Y., calls upon all persons, who desire to facilitate the cause of science, and the instruction of the young men under his charge, to send him specimens for dissection. For every specimen a written acknowledgment will be sent, and eventually, to each donor, a copy of any scientific paper in which may hereafter be embodied the result he will have helped to reach. The specimens may be sent at his expense as above. The package, if large, may be sent as freight; if small, by express. He says:

"We want brains of all animals, both wild and domesticated; nothing can be amiss, for if duplicates come of what we already have, the students can dissect the brains, or the skulls, if desirable, can be prepared. When possible, the size and weight of the animals should be noted; and especially the sex and apparent age. The most valuable collection that could be sent us would include a male and a female, an old and a young, of the same species, the size and weight, the age and sex being marked in some way upon the specimens themselves; these would be worth more than fifty heads of different animals and bearing no such information. When the animals are small, or any doubt could arise as to their specific identity, they should be sent entire; but if large, the heads alone. Of course, a badly damaged head would not be worth the sending, unless very rare; and in all cases the killing should be so accomplished as to avoid injury to either brain or skull; the head should be cut off with one or two of the neck vertebræ attached, so as to save the *medulla oblongata* at the nape of the neck, and should be kept in a cool place before sending.

"We want the unborn young of all animals, and at all stages of development; as a rule, the smaller the better, but, as with the brains, hardly any specimen of this kind would be amiss: for where it is too large for entire preservation in alcohol, special organs may be prepared (the brain, stomach, etc.), so as to be extremely useful in showing the manner of the animal's development. On account of the extreme delicacy of these specimens, great care must be exercised in procuring and sending them. When possible, they should be kept and sent in the womb, the fluid contents of which are the best protection; but if this cannot be, then they should be placed in a jar or can with water and a little salt; larger embryos (colts, calves, etc.) may be laid upon hay or tow, and packed in a box, great care being had to prevent any pressure upon the head, for the skulls of unborn animals are so soft as to yield, and the brains are then ruined. Still-born or aborted animals are particularly useful if the time since conception is known; but embryos are often found in animals killed in the chase or for food. Of course, the species from which the embryos are taken should be noted, and, in case of domesticated animals, the exact breed so far as known; the pure breeds are most valuable for both brains and embryos, such as the ass, the mule, the different breeds of horses, the Newfoundland dog, and indeed nearly all the breeds of dogs, the brains of which differ among themselves to a wonderful extent.

"Such monsters as animals with two heads or two tails, or an unusual number of limbs or toes, or with but a single eye in the center of the face, etc., usually die soon after birth, and are then looked upon as mere curiosities, and so thrown away. Such specimens are of the greatest value to science. Gœthe, who was naturalist as well as poet, well said: 'It is in her monstrosities that Nature reveals to us her secrets,' and many of the more obscure laws of life and organization have been elucidated by the aid of these unfortunate creatures, which go astray before they are born, and live only to die. The not infrequent occurrence of such malformations among the human race should alone induce a careful study of whatever may lead to a knowledge of their nature and possible causes. There are few persons, especially living in the country or upon farms, who have not occasional opportunities of procuring such specimens as we desire; but none are so likely to have them as the hunters, the butchers, and the stock breeders; let me ask all such to save and send the specimens that almost daily come into their hands. Their value to us and to science is not to be estimated by the little trouble it may take to procure them, or the price which ignorance sets upon them."

Advantage of Californian over European Wine Growers.

In Europe, they only reckon to secure in ten years one good crop and fine quality, and two more crops of fine quality, but small quantity; while seven vintages are reckoned as being of poor quality, small quantity, and total failures. In our State, the variation in quality seldom amounts to five per cent, while the most disastrous years have not lessened the crop below the ordinary yield more than twenty-five per cent in quantity. This very variation in quantity can be fully known three months previous to the vintage, thus allowing the producer ample time to secure his casks, and furnishing him positive knowledge as to the number required. In other countries, even fourteen days before the vintage, there is no certainty of a crop; a wind, a rain, or a hail storm is apt to occur at any moment and devastate the entire vintage. All is uncertainty there; nor has the vintner any possible means of positively ascertaining how many casks he must provide. In abundant years in the old countries, the exchange has often been made of so many gallons of wine for an equal number of gallons capacity of casks. The disadvantages of being forced to secure such immense quantities of casks in so limited a period are too easily perceived, and we certainly cannot appreciate our own advantage too much in being very differently situated.

Another great benefit, derived from the long continuance of the dry weather, is the exemption from weeds in our vineyards after the final plowing. Thus all the nourishment and strength of the soil go wholly to their destination, the vine, and hence the vigorous appearance that even the most delicate imported varieties acquire even in our poorest soils. They necessarily bear much more. This circumstance will also explain, in a measure, why our cultivation does not cost as much per acre as that in European countries, though our labor is so much higher. The advantage of our dry weather does not end here; it precludes the possibility of continued mildew, and allows the vintner to leave his vines unstaked, the bunches of grapes actually lying and securely ripening upon the very ground, without fear of frost or rotting. In this condition, the grapes mature sooner, are sweeter, and, it is believed, possess more flavor.—*Overland Monthly.*

PRESERVATION OF STONE.—Doctor Eugéne Robert, of Paris, recommends copper salts as being the best preservatives of stone in a damp climate. These salts prevent the formation of lichens, to the action of which M. Robert attributes the destruction of stone. This is, without doubt, true for granite, but its efficiency for sandstone is questionable. The latter deteriorates by exfoliation, without the development of any vegetation.—*Les Mondes.*