TALK WITH THE BOYS

A Dialogue in Practical Science between a Father and his Sons.

No. 1.—Gas.

"Father, what is gas?"

"Any substance while it is in the state of air or vapor is called gas. Water assumes the gaseous form under the full pressure of the atmosphere at a temperature of 212°. If a vessel of water is heated over a fire, some portions at the bottom first acquire such a temperature that they are expanded into vapor, when they rise in the form of little globes, producing that peculiar commotion in the liquid which is called ebullition, or boiling. If the pressure of the air on the water is lessened, by carrying it up a mountain, it takes the gaseous form, or boils, at a lower temperature; while if the pressure is increased by confining it in a tight steam boiler, it requires a higher temperature than 212° to convert it into vapor. Some substances boil at lower temperatures than water, as alcohol at 173° and sulphuric ether at 96°, while others require a far higher temperature, the boiling point of mercury being 662°. It is supposed, however, that all substances would take the gaseous form if sufficiently heated."

"But we meant gas that is used to light houses with."

"Oh! illuminating gas. This is composed almost wholly of two substances—carbon and hydrogen. Hydrogen, when uncombined with other substances, has never been seen in either the liquid or solid state; it is therefore called a permanent gas. In combination, however, it is solid enough, as you have found if your feet ever slipped up on the ice, for it is one of the component parts of water. Charcoal is almost pure carbon; so is the diamond. Illuminating gas is a mixture of two gases, each of which is composed of hydrogen and carbon. But if I am to explain chemical combinations to you, I must have some little balls to do it with. What is the very lightest substance that you can think of that can be made into a little ball?"

"Pith of elder."

"Yes, or of corn stalk. Neither of these is light enough, but we must take what we can get. You go, Charles, and get a piece of dried corn stalk and make a lot of little balls of the pith, all of the same size, and I will make a number of wood of the same size but six times heavier; and, John, you may go and ask your mother for a needle and thread."

"How large shall I make the balls, father?"

"We will make them of a convenient size to handle, for if we make them as small as we can, they will still be thousands of times larger than the atoms that I want to represent with them. Now, to be just right, the wooden balls should be precisely of the same size as those of pith, and should be just 6 and 4 one-hundredths times more heavy. The pith balls are intended to represent an atom of hydrogen, and we will mark them H."

"What is an atom?"

"It is something that nobody ever saw, but it is supposed that all matter consists of portions so small that no human mind can conceive of their exceeding minuteness, and these portions are called atoms. Atoms of carbon are 6 4-100 times heavier than those of hydrogen, and I will mark my balls C, to represent atoms of carbon. Now, give me the needle and thread and I will soon show you the chemical combination of illuminating gas. I will first fasten two atoms of hydrogen to one of carbon, and this forms an atom of *light* carbureted hydrogen. When we wish to speak of it, instead of writing out the names of the substances in full, we will simply use the initials, marking the H with the figure 2 to show that there are two atoms of hydrogen, thus C H2. Every chemist, when he sees those letters written in that way, understands that they mean one atom of carbon combined with two atoms of hydrogen, forming one atom of light carbureted hydrogen. This is one of the two gases which, when mixed together, constitute illuminating gas. The weight of an atom of hydrogen is called 1, its atoms being lighter than those of any other substance; and as the atom of carbon is 6 and 4 one-hundredth times heavier than the atom of hydrogen, its atomic weight is said to be 6.04. As the atom of light carbureted hydrogen consists of two atoms of hydrogen and one of carbon, what is its weight? Can you tell, Charles?"

"What do you mean, sir, its weight as compared with the weight of one atom of hydrogen?"

"Precisely."

"The atom of carbon is 6.04 and the two hydrogen atoms are one each, making 8.04."

"Consequently, if we had 804 lbs. of light carbureted hydrogen, how many pounds would it contain of each of its elements? You can answer that, John, can you not?"

"There would be 604 lbs. of carbon and 200 lbs. of hydrogen."

"Certainly. Now, give me four of the pith balls and four of the wooden balls, and I will show you how an atom of heavy carbureted hydrogen is formed. I do it by fastening the whole together, and the atom thus formed is expressed by the initials or symbols, C4 H4. Can you give us the weight of that, Charles?"

"If one atom of carbon is 6.04, four of them will be 24.16, add four of the hydrogen, which are one each, will make 28.16."

"That is it. I think you must have now a very clear and distinct idea of what is meant by the atomic weight of any substance.

"It means that one of its atoms is so many times heavier than one atom of hydrogen."

"Exactly. Heavy carbureted hydrogen is also called olefiant gas. Can you tell, Charles, from the derivation, what that means?"

"Is it, from *oleum*, oil, and *facio*, to make; oil making?"

"Yes, primarily; though more immediately from *olfacio*, probably. When mixed with chlorine and condensed it forms an oily liquid, from which property it has been named olefiant gas."

"You say illuminating gas consists of a mixture of the two gases—light carbureted hydrogen and olefiant gas?"

"Yes, principally; though there are generally small quantities of several other substances, but they may be regarded as impurities. Though the olefiant gas constitutes but about 15 per cent of illuminating gas, it produces nearly all the light, and the quality of gas depends mainly upon the peoportion of olefiant gas which it contains. In illuminating gas these two gases are not combined with each other chemically, but are simply mechanically mixed. Therefore, to have a complete illustration of the chemical combination of this valuable substance, we will prepare a number of balls to represent atoms of light carbureted hydrogen, and a number for the olefiant gas, and mix them together in a bowl, in the proportion of about one of the latter to five of the former. The fact that the primary atoms are fastened together with the thread to form each of the gases, and that the secondary atoms are simply mixed together, will give us perhaps as good an idea as we can get of the difference between chemical combination and mechanical mixture."

"What becomes of the gas when it is burned, and how is the light produced?"

"You will find that part of the subject very interesting, but I think we will postpone it till next Saturday."

An Injurious Fertilizer.—Very severe prohibitions have been issued in France, England and Germany against the use of *poudrette* imperfectly prepared, it having been proven by careful experiments that the fœcal matter of sinks cannot be converted with safety into garden manure under five years' careful preparation. Pestilential and other diseases are propagated by vegetables grown in soil thus manured. Yet, it is stated that these death-dispensing deposits are absolutely used in the market gardens arouud our large American cities in their natural state, and many of the fruits and vegetables so grown can be told by the nostrils or the taste before they are cooked, and in the process of cooking. It is the opinion of skillful medical observers, that nearly all the novel diseases which now afflict many American cities, owe their origin to the organic diseased matter taken up by vegetables and fruits grown in soil dressed by the fœcal matter of the sinks, and transferred to the stomach. Galloping consumption iu persons whose families have never been subject to this terrible disease, have been traced to the use of vegetables grown by *poudrette*. This is only one instance out of a thousand.—*Exchange.*

[Most of the manures used in China, Holland, England and Scotland are transferred directly from sinks to the soil; but the former are regularly cleaned out once or twice a year.—Eds.

A COLUMN OF VARIETIES.

During the year 1859, no less than 4,000,000 yards of cotton goods were exported from England daily.

Man holds his life by a very frail tenure. A distinguished physician in France recently lost his life from the puncture of a suture needle which had been thrust into a tumor.

The artesian well in progress at Macon, Miss., is now throwing a column of water some 15 feet above the surface of the earth, but it is so strongly impregnated with soda as to be entirely unfit for use.

To hit a target with a rifle at the distance of 900 yards is first-rate shooting, indeed. At that distance, a military target appears about the size of a pin's head on a postage-stamp.

An alloy, composed of 3 lbs. of lead, 16 lbs. of tin and 3 lbs. of zinc, is capable of being rolled out into plates for making white-ware of a superior quality, as a substitute for Britannia metal.

It is stated, in a late foreign paper, that bathing has been found to be a certain cure for *pleura-pneumonia*; that a gentleman in Ireland, who tried the experiment on eight cattle who were infected, saved seven of them by driving them into a bath.

The people iu several districts of New Orleans are suffering greatly from the effects of the drought. The heat of the sun has so warped the cisterns that they will not hold water. As a consequence, whisky barrels, &c., are resorted to.

A great number of very large spots in the sun's atmosphere have recently been witnessed at the observatory in Paris. They occupy, for the most part, two zones parallel to the solar equator, along which they are disposed in from 10 to 12 groups, containing about 60 spots.

The city of London, copying from New York, has lately been laid out into telegraphic districts, for the conveyance of telegraphic messages between merchants in their warehouses and their families living in distant parts of the city. The messages are charged at the rate of fourpence (eight cents) for 10 words, and sixpence for 20 words.

Several applications of wax are made by the Greeks for medicinal purposes. Thus: to hasten the suppuration of tumors, to protect certain organs from the cold, to reduce mammary swellings, linen steeped in melted wax is applied, which, when too hard, is slightly warmed over the fire and then applied to the part. Wax being a bad conductor of heat, and allowing no passage to the perspiration, the parts covered remain protected from the cold and air.

Moths are very destructive to woolen cloths and furs during the seasons when these articles of apparel are not worn. To prevent their ravages, woolen cloths and furs should be usually kept in close glazed linen bags, from which they should be taken once a week and carefully switched. Benzoin and some of the other aromatic gums prevent the attack of moths in furs; but these creatures dislike to be disturbed, and hence the virtue in frequently switching articles in which they delight to revel in quietness.

Marine glue is made by dissolving india-rubber in napththa, and adding to it powdered shellac until it is of the proper thickness. It is always applied hot, and is very adhesive under water. Fine shreds of india-rubber, dissolved in warm copal varnish, also make a waterproof cement for wood and leather. Take glue, 12 ounces, and water sufficient to dissolve it; then add 3 ounces of resin, and melt them together, after which add 4 parts of turpentine. This should be done in a water bath or in a carpenter's glue-pot. It makes a very good waterproof glue.

A vessel lately put into Newport, R. I., in a leaky condition; having been saved from sinking while on her voyage to New York from England by the captain grinding up a lot of barley which he had on board, placing this in a large canvas bag, which he attached to a pole and ran under the vessel's bottom, as near as he could ascertain, to the place where the leak was. This was, by the force of the water passing through the opening, drawn into it, and stopped the leak for 11 days, giving the crew rest, and allowing the bark to proceed on her voyage. This is a case worthy of notice by nautical men.