

THE SCIENCE OF COMMON THINGS.

NUMBER III.

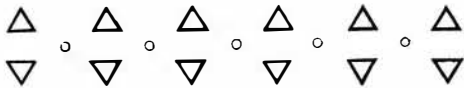
"The food of all animals, with the exception of the small quantity of common salt which they eat, consists of organic products; that is, of matter which forms a part, or which has formed a part, of either animals or vegetables. Organic substances are principally composed of four elements—oxygen, hydrogen, nitrogen and carbon. A man's body, which weighs 150 lbs., contains about 7 lbs. of carthy matter, and the other 143 lbs. consist of the four organic elements which I have named. Two of these—oxgen and hydrogen—I have already described to you; nitrogen forms about three-fourths of the air we breathe; and with carbon you are familiar under several forms. Charcoal is almost pure carbon, so is the diamond; black lead or plumbago is carbon with a little iron in it."

"Is there carbon in this piece of bread, father?"

"Yes. If you hold the bread very close to the fire, so as to scorch it, you will see the carbon all over the surface looking like charcoal."

"Why could we not see it before?"

"You could; but it had a different appearance. One of the most wonderful things in nature is the change which is wrought in the properties of substances by combining them together chemically. The air which we breathe is composed of oxygen and nitrogen mixed together mechanically. Let us have another ball to represent nitrogen and we can understand this matter perfectly. It must be made of some wood not quite as heavy as that which we used for the oxygen atom, for, though the nitrogen atom weighs fourteen times more than the atom of hydrogen, and the oxygen weighs only eight times more, the nitrogen atom is twice as large as the oxygen, being of just the same size as the hydrogen. Let us make the nitrogen atom of a different shape so as to distinguish it readily. Now, the little round balls stand for the oxygen atoms, and the large triangular ones for the nitrogen, and they are disposed thus in the air.



But if we combine them together chemically, thus—



one atom of nitrogen with five of oxygen ( $N. O_5$ ), how totally are their properties changed! When mechanically mixed, they are in the gaseous form, invisible to the eye and impalpable to the touch except when in rapid motion. But when combined as represented, the atoms immediately come close together, they assume the liquid state, and become nitric acid. As atmospheric air, it is necessary that we should be constantly passing fresh supplies through our lungs or we perish; as nitric acid, a single teaspoonful taken into the lungs would produce instant death. The astonishing variety of substances produced by different chemical combinations of the four organic elements are illustrated in the articles before you on the table. Combined in one way they produce the sugar, in another the butter, in others the tea, the coffee, the bread, the meat, the eggs, the milk, the pepper, &c. There are a few things, such as potash, that are not composed of the organic elements; but with these few exceptions, everything derived from either the animal or vegetable kingdom is formed by the combination of two or more of the substances—oxygen, hydrogen nitrogen and carbon. They form oil, india-rubber, strychnine, chocolate, cider, wine, alcohol, lard, and the principal part of our clothes, shoes, hats, books, tables, floors, ships and, in short, everything that is derived from either animal or vegetable growth.

THE *American Engineer* is the title of a journal published in this city, devoted to the interests of locomotive, marine and stationary engineers, and edited by John C. Merriam, Secretary of the American Engineers' Association. It is the only journal of the kind published in this city, and is well edited. We wish our cotemporary much success.

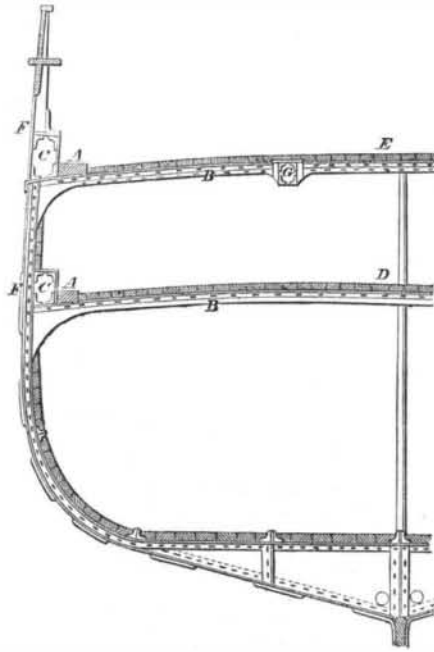
In France every steam boiler is required by law to be furnished with a safety plug of fusible metal. It is composed of tin, 3 parts, lead, 2, bismuth, 4. A plug of this composition melts at a comparatively low heat.

LESLIE'S IMPROVEMENTS IN IRON SHIPS.

We find the following description of this important invention in the London *Mechanic's Magazine* :—

Mr. Andrew Leslie, of Hebburn Quay, Gateshead, iron shipbuilder, has patented an invention entitled, "Improvements in the construction of iron ships or vessels, and for strengthening the same." Mr. Leslie thus describes his invention.

"My said invention relates to the construction of iron ships or vessels and to the strengthening of the same at those parts where the strain is most felt by means of wrought iron, steel, or other metal box girder stringers or tubes, such box girder stringers being placed on the top of the main spar or lower deck beams at the sides of the vessel, or placed under or between the main spar or lower deck beams at or near the center line of the vessel, or at the sides of the hatchways. The whole or any of these stringers may be continued throughout the entire length of the vessel or extended along any part thereof, as may be desired. According to one mode of carrying out this invention, I propose first to secure a plate, A, as shown in the engraving (which represents part of a transverse section of an iron ship constructed according to my invention), on to the top of the beams, B, of the vessel, this plate extending entirely round the vessel and serving as a base or foot plate



upon which the wrought-iron box girder, C, is constructed. This box girder stringer extends along each side of the upper and lower decks, D and E (when two decks are used), and runs from stem to stern of the vessel or along any part of the length thereof. These box girder stringers, C C, are composed of wrought iron, steel, or other metal plates bolted, riveted, or welded together, and connected to each other and to the base plate by flanged plates or angle iron as shown. The base plate, A, may be made considerably wider than the stringers so as to project inward toward the deck for the purpose of having the water-way bolted thereon, and the outside plates of the stringers may be carried up some distance above the top of the same, as shown at F F, for the purpose of securing the stanchions thereto. G G are the middle or intermediate box stringers or tubes also composed of wrought iron, steel, or other plates, and extending from stem to stern of the vessel or over any part of the length thereof, being secured to the beams, B. If found desirable these box girder stringers may be provided with suitable air valves in the top, bottom, or side plates for the purpose of ventilating the hold of the vessel, as it is found that the extension of the box girder stringers round the vessel admits of the gases, produced by some cargos, being readily collected and carried off."

In his patent-specification Mr. Leslie claims "the application and use to and in the construction of iron ships and vessels of hollow box girders composed of wrought iron, steel, or other metal plates, for the purpose of strengthening the same, in the manner herein before described." Fortunately for Mr. Leslie, his patent is dated 14th December 1859, about two months prior to the delivery at Liverpool of Mr. Fairbairn's lecture on iron ships, in which the distinguished author strongly recommended the adoption of just such girders as Mr. Leslie has patented.

War Frigates and Gunboats.

Russia, the third naval power of Europe, says an English exchange, intends not to be behindhand in putting on her armor, now that England has her *Warriors* and France her *Gloires*. The Russian Admiral, Count Putiatine, left London recently for St. Petersburg, taking with him, for imperial approval and ratification, the drawings and contract for an iron plated vessel of war, which is to be built forthwith on the Thames.

The Paris correspondent of the London *Times* says that a gunboat of a new model passed through Toulouse a short time since on her passage from Bordeaux to Toulon, where she is to be prepared for sea. This boat is constructed on an entirely new model, of which the plan is said to have been given by the Emperor. She is composed of steel plates, and will be propelled by two screws set in motion by a machine of 14-horse power. She will carry but one piece of cannon. The boat is shaped like a tortoise. The mouth of the cannon will pass just over the back of the fish, which will present an inclined plane to the enemy, over which the balls will slide. The crew will be completely sheltered under this roof, of which the force of resistance is so well calculated that the heaviest shot or shell cannot injure it. It is said that several gunboats constructed on the same model will pass from Toulouse to Toulon. The first gunboat ready for sea is to go round to Havre, and thence up the Seine to Paris.

NEW MODE OF VULCANIZING INDIA-RUBBER.—The Paris correspondent of the *Photographic News* states that india-rubber may be easily vulcanized by mixing it with sulphur and hypochlorite of lime. He says when flowers of sulphur and bleaching powder (hypochlorite of lime) are shaken together, a very strong odor of chloride of sulphur is immediately developed. If the mixture be somewhat forcibly rubbed in a mortar, elevation of temperature ensues, the sulphur softens, and the mixture becomes solid, while abundant vapors are evolved. When a much larger amount of sulphur than of the hypochlorite is used, and friction is avoided when the two are blended, a mixture is obtained, which being added to india-rubber paste, either with or without the addition of chalk or oxyd of zinc, which serve to give body to the compound, vulcanization is effected either at the ordinary temperatures or by a moderate heat. By this means objects of any thickness may be vulcanized.

ATMOSPHERIC FERTILIZERS.—M. Barral, of Paris, has lately made the discovery that rain water contains minute quantities of phosphorus. He believes that it exists in the atmosphere in the form of phosphorated hydrogen, which escapes from decaying animal substances. As phosphorus is necessary to the fertility of soils, we have in this discovery a key which unlocks the secret of "summer fallowed" lands becoming fertile. The ancient Hebrews were accustomed to allow the land to rest without cultivation every few years. This was, no doubt, for the purpose of restoring it from comparative barrenness by cropping, to renewed fertility. It is now well known that ammonia also exists in rain water, and this is held to be the chief of fertilizing agents. Any worn out lands may be restored to fertility by allowing them seasons for repose, in the same manner that Moses provided for the perpetual fertility of the land of Israel.

USES OF SOAPSTONE.—In Germany, soapstone or steatite is cut into pieces of any desired form, then placed in a crucible, heated to redness, and afterwards allowed to cool in a very gradual manner. Steatite, without having become hard or brittle by this operation, has acquired sufficient consistency to permit of its being worked without any difficulty; and such is the facility of manufacturing it that it has found numerous applications—such as in the making of buttons, cameos and gas-burners. To give solidity and durability to articles made from steatite, in the manner we have described, it is only necessary to expose them to a red heat for a few hours, when they become very hard. Articles made of steatite may be polished by the employment of emery, tripoli or oxyd of tin; and when impregnated with a solution of silver, and then subjected to a high temperature, they acquire a metallic luster.