

THE FOUR ORGANIC ELEMENTS.  
OXYGEN, HYDROGEN, NITROGEN AND CARBON.

## II.—HYDROGEN.

Hydrogen makes its most common appearance to us in flame. Whenever we see a blaze, there are many chances to one that there hydrogen and oxygen are entering into combination; in other words, that hydrogen is being oxydized or burned. There are a few exceptions: sulphur, phosphorus, and other volatile substances, as well as those gases which burn at all, burn with a blaze; but most of the flames that we see—the blaze of an oil-lamp, of a candle, of illuminating gas, of bituminous coal, of a wood fire, of nearly all fire—are, wholly or in part, the result of the combination of oxygen and hydrogen. In a blaze, the heat and light are all on the outside, as it is here alone that the burning gas can come in contact with the oxygen of the air. If we take a blow-pipe and blow the air through the flame, we set the whole body of the jet of gas on fire and increase the heat enormously. In the compound blow-pipe, pure oxygen gas is mixed with pure hydrogen gas as they issue from the pipe, in the proportion of eight ounces of oxygen to one ounce of hydrogen, and the most intense heat is produced which it is possible to produce by combustion.

Oxygen and hydrogen combine to form water in the proportion of one pound of hydrogen to eight pounds of oxygen; or more exactly, 1,000 lbs. of hydrogen to 8,013 lbs. of oxygen. Oxygen and hydrogen also form one other combination, in the proportion of 1,000 lbs. of hydrogen to 16,026 lbs. of oxygen. This compound is a sirupy liquid of a nauseous bitter taste, which does not become solid even in a very intense cold. Without the interposition of other substances it is impossible to make oxygen and hydrogen combine in any other proportions except these two. If we mix 8,013 ounces of oxygen with 1,000 ounces of hydrogen and touch the mixture with a spark of fire, the two gases combine with a flash and a report, forming water. There is so much teah developed that the water at first is expanded in vapor and is invisible, but it soon cools and condenses into the liquid form. If there is a single grain of either oxygen or hydrogen more than the proportion above stated, such surplus will not enter into the combination, but will remain separate and will retain the gaseous form. The other combination, which forms the sirupy liquid, is of just twice the quantity of oxygen to the same quantity of hydrogen.

Water may be decomposed by means of a galvanic battery, and the oxygen all carried into one jar and the hydrogen into another, when it is found that the oxygen, though eight times as heavy, occupies precisely half the bulk of the hydrogen.

## WEEKLY SUMMARY OF INVENTIONS.

The following inventions are among the most useful improvements patented this week. For the claims to these inventions the reader is referred to the official list on another page.

## BUNGS AND SPIGOTS FOR LAGER-BIER AND OTHER LIQUOR CASKS.

John Keane, of New York City, has a good improvement in bungs or spigots for lager-bier and other casks, by which the liquor can be preserved in good condition, on draught, for a much longer time than when a common bung or spigot is used. The improvement consists in constructing a bung or spigot with a reservoir to be filled with spirits, and with a system of passages which causes all the air admitted to the cask to pass through the spirit and be impregnated with alcohol, thereby, in a great measure, preventing its injurious action on the liquor, which is thus kept good for a long time after the cask has been tapped. The patent is assigned to John Keane and Andrew McLean Wood.

## IMPROVED COTTON GIN.

The object of this invention is to obtain a cotton gin that will gin both the large and short staple cotton equally well without injuring the fiber, and with a rapidity equal to the ordinary saw gin. The invention consists in the employment or use of three or more firmly toothed or serrated cylinders, so arranged or disposed as to rotate nearly in contact with one another and form a cotton chamber or enclosure at their inner sides, the contiguous cylinders rotating in the same direction so that they will present, at the space between them, oppositely moving surfaces to the cotton, and by the action

of said surfaces effectually separate the cotton from the seed. The invention also consists in using, in connection with the cylinders aforesaid, stripping brushes and a register; the former to strip the lint from the cylinders, and the latter to regulate the discharge of the seed from the cotton chamber. The inventor is John Wilson, of Anderson, S. C.

## IMPROVED STAVE MACHINE.

The object of this invention is to obtain a machine whereby staves for pails, tubs, &c., may be dressed, jointed, tongued and grooved at one operation, and with one and the same device. The invention consists in the employment or use of concave and convex rotating cutters, with a suitable bed-piece, tongueing and grooving cutters, and a pressure roller and cam, so combined and arranged for joint operation, that the staves may be dressed at both sides and perfectly finished, ready for immediate use as they leave the machine. The inventor is James Decker, of Reidsville, Ga.

## IMPROVED GAS-HOLDER FOR FERRY-BOATS, DWELLING-HOUSES, &amp;c.

This invention is principally intended for use on a very small scale, as for receiving and conveying for the illumination of ferry boats or other vessels, or of other conveyances, gas which has been generated on shore or in stationary works, or for the reception of illuminating gas generated in dwelling-houses or other places where it is to be used. It consists in the construction of a gasometer, with its upper portion of conical form, having sides of india-rubber cloth, or other suitable material, combined with a head of stiff material, and of such size that it may be introverted within the lower tank-like portion, to expel the gas therefrom by pressure mechanically applied to its head. It is the invention of Jas. McFarlan, of Brooklyn, N. Y.

## IMPROVED TYPE-CASE.

This consists simply of a zinc plate, punched full of small holes about a quarter of an inch apart, to be substituted for the ordinary bottom of a type-case. The object is to allow the dust to rattle through and thus keep the case clean. We have had one in our printing-office two or three months, and think it a good improvement. Any one wishing further information on the subject, may address Hunter & Gilson, Bryan, Ohio.

## FOREIGN SUMMARY—METALS AND MARKETS.

The most astounding intelligence that we have received since our last issue is that of the explosion that occurred on board the *Great Eastern*, whereby eight engineers and firemen lost their lives, by scalding and inhaling the steam, and several others were severely injured. The disaster was caused by a defective water-heater, combined with great carelessness on the part of the engineer who had charge of the working of the engines at the time of the accident. The material damage consisted of one huge funnel or smoke-pipe, 40 feet high, being blown up vertically 30 feet, and thrown on the deck; the collapse of the funnel under the deck, together with an explosion of the iron casing of the funnel. The lower part of the funnel or smoke-pipe from the boiler to the deck was 40 feet high, 6 feet in diameter, and made of boiler-iron half an inch thick. Around this was a casing of the same height and thickness of metal, with a space between the two about six inches wide, or a foot in diameter altogether. This space formed a huge annular water-heater, through which the water was pumped on its way to feed the boiler for the purpose of absorbing the waste heat from the smoke-pipe, and also to cool the space around on the outside. Owing to a defect in the working of the feed pump, its communication with the heater was shut off, so that the water was sent directly through another pipe to the boiler. As the water in the heater communicated with the boiler by a pipe at the top, of course it was filled with water, which was maintained at a heat at least equal to that of the steam in the boiler, namely, 288° Fah. A small pipe communicating with the heater, and rising above it 30 feet, had an opening in it to act as a safety valve, but it is said that a cock on this was closed, so that the safety opening could not act. As the water in the heater received continued heat from the smoke-pipe, without any cold water being fed in, the interior pipe of the funnel became very hot and collapsed, then the outside shell or heater casing pulled apart, and the water being 288° in temperature (or 71° above that of atmospheric pressure), as soon as it was

relieved of the excess of 45 pounds pressure, it instantly flashed into steam of low pressure, and with its great expansive power it at once shot the heavy funnel weighing several tons upwards, and also burst outwards circumferentially, destroying everything for a considerable space around. We describe this case with some minuteness, because it is a singular one, and goes to show how a small excess of pressure at first, sufficient merely to produce a rip or collapse, may lead to the instantaneous generation of a great body of steam and a great excess of pressure finally. It is stated that this heater was put on the funnel against the remonstrances of John Scott Russell, and was not applied to the funnel of the screw engines. Of this, however, we are not positive. No damage was done to the hull, machinery, or boilers; the engines never ceased working, but there was great consternation on board for some hours. The damages amount to about \$25,000, and will be repaired by Mr. Russell in a few weeks. It is now reported that the *Great Eastern* will assuredly come to New York, as it is expected she will not draw over 25 feet water, and may thus pass over the bar at high tide. Her brief trip from the Thames to Portland, England, has most remarkably demonstrated the superior speed of this great vessel, and her steadiness in a heavy sea. With less than one-third of the usual speed of the engines, she made 12 knots per hour, and when large ships were pitching violently about, her great mass was scarcely moved by the waves. When the *Great Eastern* was commenced a few years ago, the *SCIENTIFIC AMERICAN* expressed the opinion that her motion would be comparatively easy on the sea; that the waves would have but little effect upon the hull, so as to cause sea-sickness among her passengers. The *Nautical Magazine* took this opinion up, and pronounced it erroneous. Of course, it will require a voyage across the Atlantic to test fully the correctness of this opinion; thus far, however, it seems to have proved reliable.

The *Scotia*, a new paddle-ship to be built for the Cunard Company at Glasgow, has been designed for a considerable period; but, with Scotch, caution her proprietors and engineers have waited to see what new engineering facts might be developed in the construction of the *Great Eastern*. All the working-drawings are now prepared, and the construction of this ship will proceed with all the dispatch possible, and it is asserted that it will not be surpassed for speed by any steamer whatever.

The builders' strike in London appears to be drawing to a close, the operatives having been reduced to a very low state for want of funds; still they have mostly refused to sign the conditions given them by the master-builders, namely, to repudiate all connection with the Trades' Societies. The London *Mechanics' Magazine*, which has denounced strikes as injudicious and injurious, says that these operatives are more deserving of sympathy than those men who have acquired accumulated capital by means of the toil of the artisan, and who have seemed to glory in seeing their workmen starved, so that they might be vanquished.

The trade at Sheffield is in a very prosperous condition; the demand for crinoline steel is very great, and much of it is for the American market. "New York belles cut a swell which throws the portly dimensions of lusty English ladies far into the background." So says Charlie Mackay in his "Notes on America," just published.

We omit our usual table of the English metal market, because the change in prices is so little varied from last week that we have occupied the space with more than the usual amount of other foreign matters.

## New York Markets.

COAL.—Anthracite, from \$4.50, to \$4.75 a \$5.

COPPER.—Lake Superior ingots at 23c. per lb for cash; new sheathing, 26c.

COTTON.—Ordinary—Uplands, 9c. per lb.; Florida, 9c.; Mobile, 9c.; New Orleans and Texas, 9½c. Middling—Uplands and Florida, 11½c.; Mobile, 11½c.; N. O. and Texas, 12c. Middling fair—Uplands and Florida, 12½c.; Mobile, 13½c.; N. O. and Texas, 13c. Fair—Uplands and Florida, 12½c.; Mobile, 13½c.; N. O. and Texas, 14c.

FLOUR.—State, superfine brands, \$4.60 a \$4.75; Superfine Western, \$4.55 a \$4.75; Extra Illinois, Indiana and Michigan, \$4.25 a \$4.35; Extra Ohio, \$5.65 a \$6.75; Extra Genesee, \$5.50 a \$7.25; Inferior to Choice Missouri, \$5.25 a \$8.50; Extra Kentucky and Tennessee, \$5.40 a \$6.

GLASS.—American Window—First, second, third and fourth qualities, per 50 feet: 6 by 8 to 8 by 10, \$2.50 a \$2.75; 8 by 11 to 10 by 15 \$1 a \$3; 10 by 16 to 12 by 18, \$4.50 a \$3.25; 12 by 19 to 16 by 24, \$5.25 a \$3.50; 16 by 25 to 20 by 30, \$6 a \$4; 20 by 31 to 24 by 36, \$3 a \$4.50; 25 by 36 to 30 by 44, \$9 a \$5. These prices are subject to a large discount.

HAIR.—American dressed, \$140 a \$180; dressed from \$100 a