SCIENTIFIC MUSEUM.

Combustion of Coal.

The power of a steam engine does not lie in its cylinders, beam, shaft, and levers; no, these only apply the power usefully. The force that moves the engine is steam, and that which produces steam is a chemical action—the combustion of fuel. Combustion appears to be a very simple operation, but we do not know a chemical phenomenon more difficult of a clear explanation. It consists of decomposition and recomposition. In the first place coal is solid carbon, a heavy substance, but if this be united chemically with oxygen, in parts (CO^2) it becomes carbonic acid gas.—This gas can only be formed of carbon and oxygen, by the chemical action which we call combustion, as exhibited in a fire (we do not speak of fermentation—slow combustion). The question may well be asked, what is the cause of combustion? It is an important one, and like a great many others, it is easier asked than answered. We only know that when a certain amount of heat is generated in fuel, by the particles of it changing their condition and arrangement, the oxygen of the atmosphere separates from the nitrogen with which it is chemically united, and combines with these carbon particles forming carbonic acid gas. This action is called combustion—fire—great heat is developed, the coal is said to be decomposed by it, and the union of the carbon particles with the oxygen—a new composition forming a gas, which, strange to tell, extinguishes flame and fire, although it is itself the direct product of fire. The heat generated by combustion imparts a like action to water, through bars of brass and plates of iron, and changes its condition from water to steam, which occupies 1,700 times the space of water. It is this expansive force—the combination of water and heat, which is the vital power of the steam engine. There is just as much philosophy to be learned in investigating the causes of making a tea kettle boil, as those of volcanic eruption, and the information to be derived is more practical and useful.

As carbonic acid gas is formed of (CO^2) it requires two pounds of oxygen to saturate every pound of coal to form this gas. If, when burning coal, it is not completely saturated with oxygen, a gas called carbonic oxide (CO) is formed with one pound of oxygen to one of carbon, which is not so expansive, consequently a great loss of heat is experienced.—We then see the necessity of supplying fuel in a state of combustion, especially when fresh coal is put on the fire with a plentiful supply of oxygen.

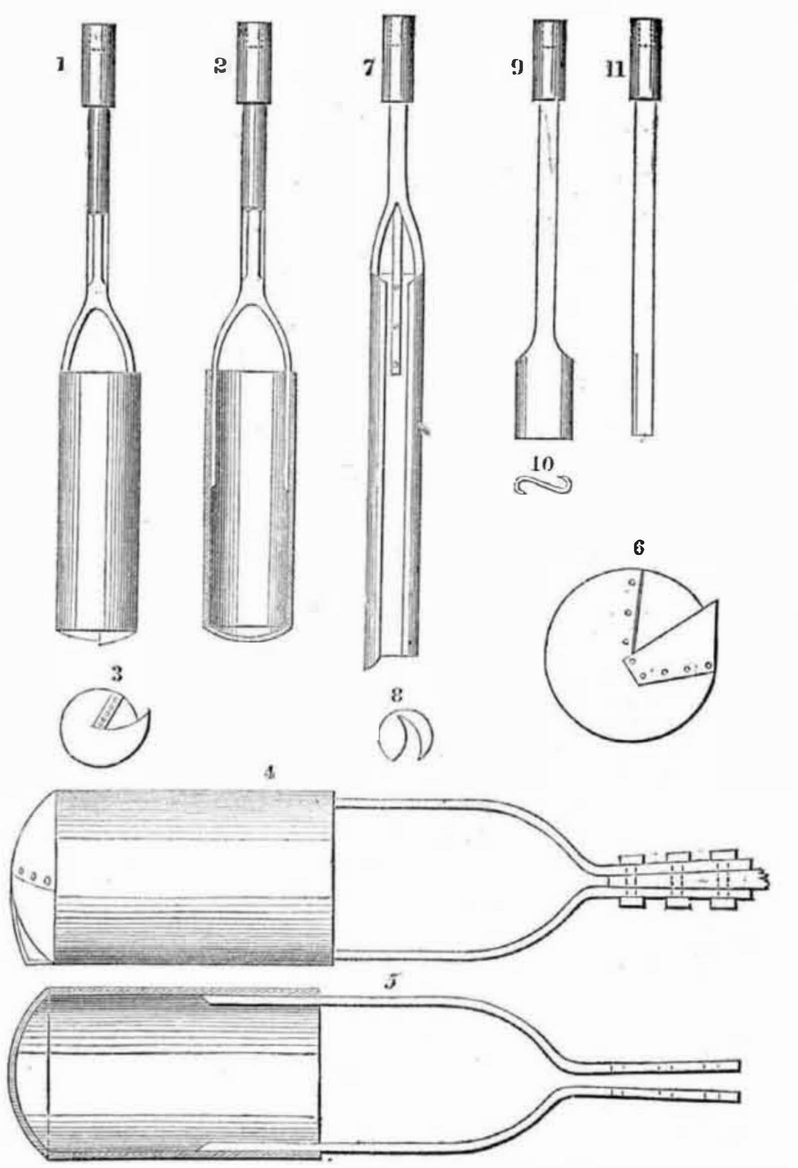
As the atmosphere is composed of 21 volumes of oxygen to 79 of nitrogen, it follows that a great quantity of air must pass through a fire to supply a few pounds of coal with sufficient oxygen to form perfect combustion.—For every two pounds of oxygen extracted from the atmosphere, exactly 7 pounds of nitrogen must also pass through a fire (nitrogen is the heaviest gas,) consequently nine pounds of air must pass through a fire for the perfect combustion of every pound of pure carbon—coal. Now, as 100 cubic inches of the air weigh 31·0117 grains, and as 5,760 grains is one pound, and 1,728 cubic inches form 1 cubic foot, it follows, $5760 \times 100 \div 31 \cdot 0117 =$ (leaving out the decimals) that we have 18,583 cubic inches, or more than 10 cubic feet of air to weigh 1 lb., which makes more than 90 cubic feet of air which pass through a fire for the perfect combustion of one pound of coal. In furnaces, it is calculated that nearly 200 cubic feet of air pass through the fuel for the combustion of one pound of coal.

We see by this what an amount of air is necessary to be admitted into rooms during the winter season for the complete combustion of the fuel in stoves and grates. This must be supplied through crannies, cracks, or open seams, for it is chemically impossible that the fire will burn unless supplied with its due proportion of oxygen. This is the reason why, in a close warm room, if we lay our hand upon any seam near a window, we feel a rapid current coming in. This fact teaches us how necessary it is to have rooms well ventilated, and why large rooms are more healthy than small ones. How wonderful an atmosphere is that of ours, which acts as the generator, regenerator, and conductor of both heat and cold; its own purifyer and renovator.

Well Sinking—Artesian Wells.

(Continued from page 96)

TOOLS.—In the annexed cut, figures 1, 2, and 3 show an elevation, plan and section of an auger. The tapped socket is for the purpose of allowing the rods to be screwed into it. The leading nose, *a*, is for cutting, and the valve, *b*, is to prevent the material that is cut from falling out of the auger while it is being raised to the mouth of the bore. Figures 4, 5, and 6 represent a similar auger of larger size; it has not a screw tapped into a socket as the former one, but is bolted, instead, to an intermediate rod. Figs. 7 and 8 are two views of a small auger with a longitudinal slit and no valve; it is used chiefly for boring through clay and loam. In very stiff clay the slit may be a very wide one, in soft clay narrower; while in very moist ground, it is inadmissible altogether. Figs. 9, 10, and 11 show an S chisel for cutting through rocks, flints, &c.; this tool is worked with a vertical and circular motion.



Thomas Prosser, C. E., of No. 28 Platt street, this city, who furnishes tubes answer, able for Artesian borings, has issued a small pamphlet on this subject. It is merely, as it states, a few loose remarks thrown together with reference to works where other information may be found. It quotes an extract from the "London Mechanics' Magazine," which recommends Dr. Pott's method of sinking iron tubes for wells of large diameter, when the substances to be bored consist of loose sand or the like. This process of sinking tubes is by atmospheric pressure, extracting all the air from the interior of the tube by an air-pump, when it descends with great rapidity. It is secured by a patent in the United States, of which C. Pontez, C. E., is the assignee. The process is illustrated on the first page of this volume of the Scientific American. The boring tool must always excavate or bore an opening somewhat wider than the tube, in order that it may descend into its proper place as the sinking proceeds. If the boring for water was through a rolid rock, no cylinders would perhaps require to be sunk—none if there were no veins of water met with above the main supply. When the lower water supply is depended upon entirely, no intermediate seam of water should be allowed to have any communion with that which rises from the lowest depth; it is therefore necessary that the sunken pipes should be well fitted, to prevent any communication between the lower water stratum, and any one that may be above it. The surface water must also be perfectly stopped out, and Pott's iron cylinders appear to us to be a good plan for this. The common way is to stone or brick up the first 30 or 50 feet of excavation, puddling between the outer courses of brick with good clay, and making good joints with hydraulic cement.

(To be continued.)

Accoustic Telegraph.

Won't the Scientific American give us its opinion of the practicability of a speaking telegraph? How far can a good pair of lungs make themselves heard through a tube of half inch diameter (or an inch if it would be better?) The advantages of such a telegraph are too numerous to mention—what are the difficulties?—[Savannah Journal.

We know of no difficulties in the way of the speaking telegraph, except the expense of the lines; they cannot be erected so cheaply as telegraph wires, nor can they be operated so rapidly. The extreme distance through which two individuals can communicate through a tube, we do not know, nor do we believe experiments have ever been made on a scale sufficient to test the question. For short distances through public buildings they operate well, and are in general use, but for public use they are far inferior to the electric telegraph. Gutta percha tubes would be the best and cheapest to use for long distances. We are of opinion, however, that the accoustic telegraph is not so much employed as it might be, especially on shipboard, in prisons, hospitals, asylums, &c.

Mechanical Lecture.

C. H. Haswell, Senior Engineer, U. S. Navy, delivered a lecture before the Engineers' Institute, of this city, on the evening of the 25th ult. The subject was the impact of falling bodies, and to present a rule for calculating the effect of the falling weight in a pile driver. He illustrated his remarks with experiments. The subject is an intricate one. The force of a falling body is its momentum, composed of the weight multiplied into the velocity. After the lecture, Mr. Lindsay, the Secretary, made some appropriate remarks;—this institution, we believe, is in a flourishing state.

Folliculitis, Commonly Called "Clergyman's Sore Throat."

An article under this caption appeared on page 64 of this volume of our paper, in which the name of Dr. Warren, of Boston, Mass., is mentioned as being the discoverer. As there are a number of Dr. Warrens in Boston, and to avoid confusion, we are requested to state that it is Dr. Ira Warren, No. 1 Winter Place to whom belongs the merit of the discovery.

LITERARY NOTICES.

NAPOLEON DYNASTY—Published by Cornish, Lamport & Co.: New York.—At the present moment, when the Napoleon name is again acquiring, or rather, has re-acquired a fresh ascendancy in the politics of Europe, any new information with respect to Napoleon Bonaparte or his family, is a subject of particular interest. The above-named work is an original publication, lately issued from the press, and appears very *apropos* to satisfy public curiosity. One of its peculiar features is the space devoted to the biographies of the members of the Napoleon family, some of whose descendants appear destined to play a conspicuous part in the future history of the world. During the life time of the great Napoleon, his kindred were obscured by the dazzling glory of his fame, so that comparatively little attention was directed towards them, every writer of the times confining his remarks to the absorbing theme—Napoleon the General, Consul, and Emperor. This work does infinite credit to our country; it is written by the "Berkley Men," and published as mentioned above. It contains over 600 pages, illustrated with portraits; size demi-8vo., cloth; price two dollars and a-half.

LITTELL'S LIVING AGE—No. 449 of this, the best of all weekly magazine re-publications, contains an article on the Life and Writings of Justice Story, from the Edinburgh Review, which is flattering to the memory of our great countryman. Every American should read it. It says, "he was the author of more text books of a higher order, and on almost every branch of Jurisprudence, than any writer of his age."

PRACTICAL MATHEMATICS—With Drawing and Mensuration, applied to the Mechanic Arts, by Prof. Davies, the author of so many useful mathematical works: published by A. S. Barnes & Co., No. 51 John street, this city. This is a very useful and excellent book, embracing a collection of much that is instructive; the section on Topographical Drawing is worth the whole price of the book.

TEETH OF GEAR WHEELS—A practical treatise on the teeth of gear wheels, by Prof. Willis, F.R.S., is an excellent Tract; published by Joseph P. Pirrson, No. 5 Wall street, this city.

THE WHIG REVIEW—For December, contains a splendid picture of Daniel Webster, accompanied by an able article from the pen of Prof. Felton, besides other political and literary articles. Terms of the Review $3 per annum; Champion Bissell, publisher, New York.