SCIENTIFIC MUSEUM.

For the Scientific American.

Science and Philosophy.

Man is the interpreter of Nature: science is her language, and philosophy, the interpretation thereof. On observation and experience is built the whole superstructure of science; and, since facts constitute the foundation of correct theory, science must precede philosophy. It is the object of science to ascertain the constant conjunction of successive events, constituting the order of the universe; philosophy traces the necessary connections. Science records the phenomena which it exhibits to our observations, and refers them to general laws; philosophy investigates the nature of those efficient causes on which they depend. Newton's immortal discovery that the earth gravitates is only an addition to the mysterious gravitation of the apple, not an explanation; it is the generalization of a fact, not the discovery of an efficient cause. It is the province of science to state, of philosophy to explain; of the former to multiply and arrange phenomena, of the latter to draw conclusions; of one to give an account of things, of the other to account for them. A scientific man may be "undevout and mad," but a philosopher cannot. Mere science eclipses the Creator from the view of men; but a coalition always exists between true philosophy and religion. Were it not for philosophy, nature would only manifest herself, not her God. By it, the theater of nature is rendered more coherent, for it is the science of her connecting principles. Science may do without philosophy, but philosophy cannot exist without science. This idea forms the groundwork of Bacon's "Novum Organum," while the Aristotelians reasoned from causes to effects, and from generals to particulars. This great pioneer of nature demolished the old building of a false philosophy, and with the skill of a superior architect laid the foundation of another fabric, by which the genius of Newton ascended to the third heavens of truth, and in which the mind of Locke awoke to all its strength. But a counter revolution seems to be taking place at the present time. There is a rising tendency to revert from experiment to deduction; an effort is being made to move back those pillars which the mighty Hercules advanced. But rational inquiry can never proceed on any plan other than that of Bacon, for the inductive method is founded on the principles of human nature. J. W. O.

Balloon Excursion by Moonlight.

A recent Paris paper gives an entertaining log-book of an ærial voyage recently performed by M. Eugene Godard and half a dozen companions, on a brilliant moonlight night, M. Godard was endeavoring to demonstrate his ability to steer the atmospheric ship as conveniently as one riding on the water, and appears to have succeeded to a charm. He passed from one point of Paris and its environs to another, picking up his passengers, and stated, when he finally arose, to what points in the department he proposed to travel, and fulfilled his promises with wonderful exactness. When passing over Clichy, at an immense height, the scene is described as one of fairy-like beauty. The moon was on the horizon, the heavens entirely free from cloud or vapor, glittered with stars; and below, the different streets and boulevards of Paris were distinctly pourtrayed in long lines of light. At those *gonglia* of the city, the Place de la Concorde, the Palais National, &c., the effect of the gas lamps was to produce an atmosphere dazzlingly phosphorescent, and perfectly magical in its intense coloring; and the elevated towers of Notre Dame, the columns and domes, stood out in dark relief from the glaring ground. After voyaging for some hours, the balloon descended at Garges, and the party travelled cosily and safely upon terra firma back to the city.

Curiosities of Water.

The Edinburg Quarterly Review is the most able foreign Journal, scientifically devoted to reviewing works of science, especially chemical works. From it, we select the following beautiful extract on water:—

"Nor is the hailstone less soluble in earth than in air. Placed under a bell-glass with twice its weight of lime, it gradually melts and disappears; and there remain four parts instead of three, of perfectly dry earth under the glass. Of a plaster of Paris statue, weighing five pounds, more than one good pound is solidified water. Even the precious opal is but a mass of flint and water, combined in the proportion of nine grains of the earthly ingredient to one of the fluid. Of an acre of clay land a foot deep, weighing about one thousand two hundred tons, at least four hundred tons are water; and, even of the great mountain chains with which the globe is ribbed, many millions of tons are water solidified in earth.

Water, indeed, exists around us to an extent, and under the conditions which escape the notice of cursory observers. When the dyer buys of the dry salter one hundred pounds each of alum, carbonate of soda, and soap, he obtains, in exchange for his money, no less than forty-five pounds of water in the first lot, sixty-four pounds in the second, and a variable quantity, sometimes amounting to seventy-three and a half pounds, in the third. Even the transparent air we breathe contains, in ordinary weather, about five grains of water diffused through each cubic foot of its bulk, and this rarified water no more wets the air than the solidified water wets the lime or opal in which it is absorbed.

On Boilers.---No. 1.

We commence this week a series of articles on steam boilers. They will be illustrated by engravings and will continue throughout the greater part of this volume of the Scientific American. They will be found to possess a great deal of interest to many of our readers, and will present an amount of information on the subject not to be obtained in any other work of the kind. The information will be selected from various sources, Hebert, Armstrong, patents for improvements, in short, they will embrace a wide range of works, a little from one and a little from another, according as it is valuable, so as to present a vast and varied amount of useful matter on the subject, which will be kept for future reference by all interested in it.

The grand objects of a good steam boiler are economy of fuel, safety, and small expense for repairs. The boiler which can generate the greatest amount of steam with the least quantity of coal in a given time, is the best respecting its evaporative qualities, but there are so many qualities involved otherwise, that it is best to present the subject analytically and synthetically at the same time.

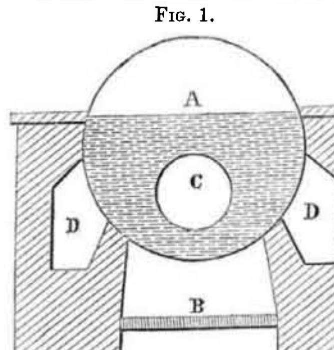
It was common to calculate the evaporation of a cubic foot of water per hour for a horse-power, and by Boulton and Watt's formula, 14 lbs. of English coal were allowed for the evaporation of a cubic foot of water. Nine square feet of boiler heating surface, and one square foot of fine grate surface were allowed for each horse-power.

The mechanical force of a cubic foot of water converted into steam is greater than this, and at the present day no such an amount of coal is consumed. A horse power is estimated at 33,000 lbs. lifted one foot high per minute, and whatever may be said by some engineers against estimating engines by *horse power*, it is absolutely necessary that there should be some unit of measure, and none is better than this one of Watt, for it was the result of actual experiments, and 33,000 lbs. lifted 1 foot high is equal to 150 lbs. raised 220 feet nigh in the same time, and this is divisable by six, the effective pressure per circular inch of steam at 8 lbs the square inch, and which is equal to a 40 horse-power engine of 25 circular inches for every horse power.

A cylinder then, of 5 inches diameter, (25 circular inches area) with an effective pressure of 5 lbs. and the piston travelling at 220 feet per minute, will give out one horse-power. This only refers to low pressure engines, but as the steam boiler is the magazine or source of the engine power, and the engine only the arms to work it, more will be learned about the boiler as we proceed.

The accompanying engraving, fig. 1, is an experimental cylindrical boiler employed by Armstrong. A is the boiler; B is the grate; C is the flue; D D are the return flues. This boiler is a kind commonly used in high pressure engines, the form being considered the strongest. The shell of this boiler was 5 feet diameter outside, and 9 feet long. The flue, C was 18 inches diameter, the fire grate was 3 feet 6 inches square ($12\frac{1}{4}$ square feet area), placed close to the boiler at one end. The flame or smoke after passing under the boiler bottom to the the back end, rises up, returns through the inside flue to the front above the fire door, where it divides itself into the two brick flues, D D, and passes along to the back end and up the chimney. This is the *split draft* boiler. Allowing 6 square feet of heating surface, for each horse power we have in this boiler, diameter of boiler, 5 feet, inside flue $+ 1\frac{1}{2}$ length $\times 58{\cdot}5 \div 6 = 9{\cdot}75$, gives 9 3-4 horse

FIG. 1.



power. This boiler evaporated 10 cubic feet of water per hour, with 13 lbs. of Liverpool coal, for each horse power. It was attached to a high pressure non-condensing engine, working with a pressure a little above 30 lbs. per square inch. The side heating surface, and the under heating surface are both put together as equal in point of effect for generating steam, but it is generally considered that the side surface is only about one half, as good as the under surface of a boiler exposed to the direct fire action. It must be remembered that it is quite possible for an engine by bad packing, and bad exhaust of the valves, to eat up the profits of the best boilers. It has sometimes happened that the blame has been attached to the boiler, when it should have been to the engine, and there is much in the manner of firing the same fuel. A thin clean fire is the most economical. The above boiler worked an engine, the piston of which was not very well packed, hence the amount of fuel consumed. It is but a short boiler in proportion to its diameter, and when this is the case, it is best to have a central flue, but where there is room for a long narrow boiler, the central flue is not necessary.

Ice Cultivation.

A gentleman of Boston has adopted a system of ice culture, for the purpose of preserving that cooling substance early, or when the season is too mild to freeze over the deep water of the Fresh Ponds. His plan is to make an artificial pond, of an equal depth, and let the water into it as fast as it freezes. Workmen are now engaged in large numbers on the Fresh Pond Meadows, in preparing such a pond. It will cover about twenty-five acres of land, with a clay botton, and so much lower than Fresh Pond, that the water of the pond may be let into it in any quantity desirable. As this pond will be very shallow, it will freeze over readily, and it would seem must secure a crop of ice in the mildest of Boston winters. Of course it may be cropped as often as it can be frozen of sufficient thickness. The making of the pond, it is calculated, will cost about twenty-five thousand dollars, or one thousand dollars per acre, and the necessary buildings for storing the ice about as much more.

Cotton Mills.

The annual products of all the cotton mills in the United States, is stated to be 250,000,000 yards, and the consumption of cotton 600,000 bales; 100,000 bales of which are consumed south of the Potomac, and in the Western States. The value of the amount of cotton when manufactured, is supposed to be upwards of sixty-seven millions.

Wine of Wild Oranges

Orange wine is a new curiosity introduced in the New Orleans market. It is made of the juice of the wild or sour orange, which abounds in almost every plantation in the State, but has hitherto been regarded as a useless product.

There are fifty cotton mills in Russia, with 600,000 shuttles. In the whole of the Zollverein there are only 750,290 shuttles.

LITERARY NOTICES.

PUTNAM'S HOME CYCLOPEDIA, in six volumes, each complete in itself.—We have already called attention to volume 3, devoted to the useful arts. Volume 2 relates to General Literature and the Fine Arts, by Geo. Ripley and Bayard Taylor. The design of the compilers has been to furnish the reading community, and more especially the large class of students in our colleges and seminaries of learning, with a comprehensive hand-book or lexicon, of all branches of literature and art. It treats of painting, sculpture, architecture, theology, philosophy, criticism, &c:, in a concise and popular form, and several wood engravings have been introduced in illustration of different subjects. We find this work an important adjunct to our library, and we recommend it to our readers as a most useful and well arranged publication; pp. 650.

The publisher of the volumes which compose the "Home Cyclopedia" has been most fortunate in selecting authors competent in every way to carry out the objects embraced in the work. Vol. 5, by Parke Godwin, is a Universal Biography, more eleborate in detail than any similar work heretofore issued. It is invaluable as a work of reference, and the author and compiler has done the public much service by the faithful performance of a task so arduous. Pages over 800. Geo. P. Putnam, Broadway, N. Y., publisher.

DICTIONARY OF MEDICAL SCIENCE.—We have received a copy of the second edition of this great work by Robley Dunglison, M. D., Prof. of the Institute of Medicine, in Jefferson Medical College, Philadelphia, Pa. This Dictionary is an encyclopedia of medical information, and is essential to every man who wishes to be intelligent upon all subjects. Those who read medical works (and he who does not is a barbarian) cannot do so intelligently without a medical dictionary. A vast amount of useful information is conveyed in the brief definitions of Dr. Dunglison,—no other work contains the information embodied in this, not one. It is published by Blanchard & Lea and for sale by A. S. Barnes & Co., 51 John st., N. Y.

TRAUTWINE ON EXCAVATIONS AND EMBANKMENTS. By John C. Trautwine, C. E., Philadelphia.—This work is another leaf to the laurel of Mr. Trautwine, and is an accompaniment to his previous work on Railway curves. His book is a "Ready-Reckoner" for cuttings, &c.; tables for this purpose are prepared, and the method pursued is by diagrams, a plan which originated with him some years ago, but not till now made public. So far as we are enabled to judge from a brief examination of Mr. Trautwine's book, it appears to possess more practical interest to engineers, generally, than any treatise on the subject that we have ever seen. There is a simple candid clearness about Mr. Trautwine's writings, which pleases us. They evince a thorough reliable understanding of the subject upon which he is treating. The tables are prepared with scrupulous care and made *reliable*—something which cannot be said, we are sorry to say, of many works on engineering.

SCHNEIDER'S PRACTICAL ORGAN SCHOOL—Containing all necessary instructions in fingering, management of stops pedals, &c., together with a great variety of exercises, interludes, easy and difficult voluntaries, &c., to which is added a treatise on harmony and thorough bass, translated and adapted to the wants of young organists. Price $2,50: published by Oliver Ditson, Boston; for sale by Gould & Berry, Broadway, N. Y.

PETERSON'S LADIES' NATIONAL MAGAZINE for December, has a number of fine engravings. "The Rescue," is particularly well done. The contributions are choice and original. Dewitt & Davenport, Tribune Buildings, are agents.