For the Scientific American.

New Chemical Law.

No 1.

In surveying the present state of chemical science, now so rapidly advancing, it cannot but be perceived, that there is a great deal of confusion and misunderstanding in relation to the composition and classification of chemical substances, and more particularly in the department of Organic Chemistry, about which but comparatively little is known. It is true that chemical analysis gives us the empirical composition of these substances; but what new idea does this teach? We know that the composition of almost all organic substances, consist of the three elements, Carbon, Hydrogen, and Oxygen, united in different proportions, but this is not sufficient, something more is wanted; we want to know the true arrangement of the atoms which compose these substances? and until this is accomplished, but little advancement will be made, in this department of Chemistry.

An analysis of a substance is not complete although we way know its exact composition. In order to have it complete, it is necessary, that we should also know the true arrangement of its atoms. This is of far more importance than most chemists suppose, at least it appears, that but little attention is paid to it by them, as most all analysises of organic substances laid down in chemical works, merely give the empirical formula, but pay not the least attention to the arrangement of the atoms. For instance the composition of Quinine is given as C_{20}, H_{12}, N, O_2, now what great benefit is derived from this mode of stating the analysis? It certainly gives us but a very small amount of knowledge. If however the true arrangement of its atoms were also given, then our knowledge of it, would become complete, and we should be enabled to classify it with other substances of a similar composition.

It is evident that a knowledge of the material substances which compose a building, as brick, stone, wood &c., could give us no possible information as to its plan and arrangement, nor of its general appearance. The same is the case with a chemical substance; and although we may know its composition by analysis, as generally given; we do not understand the true arrangement of its atoms. It is therefore of the utmost importance to chemical science that the mode of the arrangement of the atoms of matter should be ascertained. It may be asked, does such an arrangement or order among the atoms of substance exist? Who is there that has ever studied the Laws of Nature, and observed the constant order and regularity, with which they are always attended, but will affirm without any doubt, that such a law does exist. The material universe was founded upon order, consequently no law of nature can exist independent of it. It is this which leads us to affirm, that all future discoveries in science must necessarily be accompanied by this order. When therefore we seek to explain the law of the arrangement of the atoms of matter, we should look for it with the expectation of finding it governed by perfect order. The theory of Types, by Dumas, is an instance of this order, and beautifully shows how a substance may retain its Types, although every element in it, may be substituted for another: the number of elements in it remaining the same.

The new chemical law which I am about to describe, is an instance of an order among the particles, of matter which when correctly understood and applied will do more for the benefit of mechanical science than can ever be imagined at the present time. While it shows the true arrangement of the atoms of matter, it leads to other important laws, which when properly understood, may be applied to the calculation of specific gravities, boiling points, and the affinity of substances for each other, also to many other properties which are at present regarded as mysteries. It may also be employed in its perfected state, to find the composition of a regularly formed substance without the aid of chemical analysis, by having the specific gravity of its vapour, boiling point, its own specific gravity, and its chemical properties given. This may appear ideal, and strange to many, and perhaps doubted; this however will not alter its truth, as the nature of the law is such, that its chemical composition is dependent upon the specific gravity of its vapor, boiling point, &c. The results which the application of this law gives, are recorded, and its truth may be seen by any one, who will take the trouble to examine it, Even in its infancy as it is now, it may be employed to approximately calculate the specific gravity and boiling points of substances whose chemical properties are known. It is a subject therefore which admits of proof, and although many may consider it unworthy of examination, yet it is capable of standing by the results it produces, whoever may assail it.

Bridgeport, Conn. S. N.

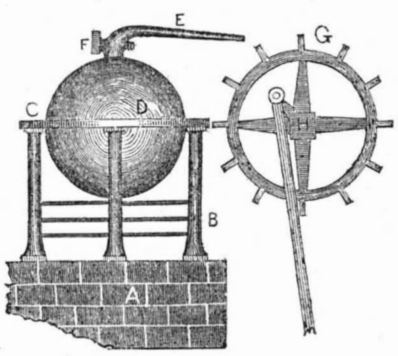
For the Scientific American.

History of the Rotary Engine.

In commencing a history of the Rotary Engine, we must first state, that it is not owing to rotary motion, " in the adaptation and arrangement of machinery," that the moderns excel the ancients, as has been asserted by an eminent author. The first steam engine of which we have any record was a rotary one—therefore in point of primogeniture the rotary steam engine is the father of the family.—The early history of steam is involved in much obscurity, but the first individual on record who applied it to produce any effect was Hero, the elder, who lived in Alexandria, in Egypt, 130 years before the Christian era.—Hero's engine was propelled by steam from a kettle, and motion was produced in the same manner as water propels the well known Barker's Mill. During the dark ages which succeeded the overthrow of Greece and Rome by the Goths and Vandals, all was indeed dark in practical mechanics. Six hundred and seventy years elapsed, after Hero made his rotary engine, before any other attempt was made to apply steam to useful purposes. In 1560 an engine similar to Hero's was proposed by Mathesius of Leipsic, to propel a turnspit. It was not, however, until 1615, that particular attention was directed to the steam engine. In that year a famous French engineer named De Caus, published a work with a drawing exhibiting the application of steam to propel machinery. De Caus also knew that a vacuum could be produced by condensing steam, but he never applied it to any useful purpose.

In 1629 Giovanni Branca, a mathematician at Rome, published an account and the following drawing of his steam engine.

Fig. 1.



Branca's Engine.

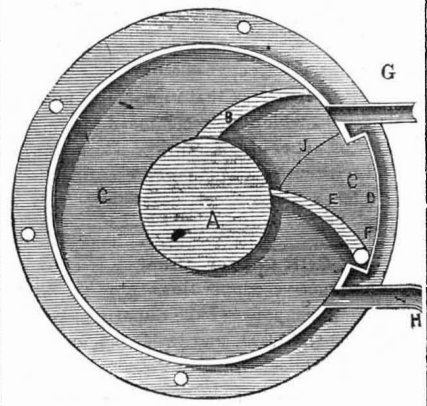
A, is the boiler platform. B, is the fire grate. C, is a frame to secure the boiler D. E, is the steam pipe provided with a stop cock F. G, is a wheel furnished with vanes, and H, is a crank secured to a connecting rod. The steam that was generated in the boiler was ejected against the vanes of the wheel, and thus operated the crank and connecting rod to propel other machinery. It is needless to notice the defects of this engine—it was not equal to that of Hero's, but it shews the modern state of the steam engine in 1629 only two hundred and nineteen years ago.

In 1663 appeared the famous " century " of inventions by the ingenious Marquis of Worcester, and he describes his steam engine, which however was not a rotary, but simply to fill a cistern with water by steam.

The first patent that was secured for a rotary engine, was that of James Watt, the famous engineer. This was in 1769. There is no drawing accompanying the first specification, which is very complex. The invention was a poor one, and the great inventor laid it entirely aside. There can be no doubt but it was very ingenious as described by Mr. Farey, in Ree's Encyclopedia, but taking it altogether it was a failure.

In 1782 he secured another patent for a rotary engine, of which the following is an engraving, and which has been brought forward within a few years as a new invention.

Fig. 2.



James Watt's Engine.

C C, is a cylinder about 3 feet in diameter and 1 foot deep. A, is an axle passing through stuffing boxes in each lid or end of the cylinder. B, is a piston which is nicely ground to fit in the cylinder, and fixed to the axle. E, is a curved flap valve. which turns upon a pivot F. The concave side of it, is a segment of a circle of the same radius with the cylinder and extending through its whole length, and when shut back into the cavity D, becomes as it were a part of the cylinder. G, is the steam pipe, and H the exhaust pipe. Steam being admitted from the boiler through G, presses equally upon E and B, (let inventors of the rotary engine look at this) but E being stopt against the axle, the piston B recedes or moves by the pressure and turns the axle A. The piston then continues the motion until it comes in contact with the concave side of the valve, which is kept to the axle by a lever or spring L, working through a small stuffing box. At this point then the momentum of the axle, on the other end of which was a fly wheel, was required to drive back the flap valve, at least a great part of the momentum. The valve was then driven into its recess D, and when the piston had passed G, it received again the action of the steam—the valve springing back to the axle. This plan was never carried into effectual operation, nor could it. The violent working of the valve was enough to condemn it, and as he used packing in his piston, it was torn away in passing over the steam pipe. He used no cut off, and therefore there was a great loss of steam, but we must say, that this is the only point of difference between it and a *new* one that we have examined not long ago, and which would have saved the inventor much time and money had he been acquainted with the many different kinds of rotary engines that had previously been brought before the world.

All living inventors and patentees of rotary engines, who are desirous of having their inventions included in this history, should embrace this opportunity, Neat drawings will be required. We have collected a mass of drawings on this subject, and this will be the only single and best history of the rotary engine ever published.

Test for the purity of Magnesia.

The common magnesia of the shops (which is a carbonate) is frequently adulterated with chalk; this may be detected by adding a little diluted sulphuric acid, which, with magnesia forms a very soluble salt, but with lime, a very insoluble one. Pure magnesia (called calcined magnesia, in the shops) dissolves in diluted sulphuric acid entirely, and without effervescence.

By the last news a case of cholera had appeared in London. The free use of spices and a generous diet was recommended.

Analyses of Milk.

The chief component parts of milk are those, which, when separated, are known as forming butter and cheese; the residue of which is called whey. These are distinguished by scientific persons as the *butyraceous*, or oily substance producing cream, of which butter is composed; the *caseous* matter, of which cheese is formed, and *scrum* or whey:

Cream forming :	4.5 parts of 100.
Chease : : :	3 5 do
Whey : : :	92.0 do

This can only convey a general idea of the component parts, for they must necessarily vary according to the quality of milk.

The analysis of skimmed cows' milk is stated by chemists to be:

Water : : : :	918 75 of 1000
Cheese, with a trace of butter	38.00
Sugar of Milk : : :	35.00
Muriate of potash : :	1.70
Phosphate of potash : :	0.25
Lactic acid with acetate of potash	6.00
Earthy phosphates : :	0.30

Instruments have been invented, called lactometers, for ascertaining the richness of milk in nearly the same manner as that employed for trying the strength of spirits. The difference in the quality of milk between particular cows may thus be determined, but it does not show whether the caseous or butyraceous matter predominates.

Zinc.

Zinc forms the link between the brittle and the malleable metals. It is a modern discovery that at a temperature of from 210° to 400° of Fahrenheit, it yields to the hammer and may be drawn into wire, or extend into sheets. At a very elevated temperature it may be pulverized, and, when in fusion, be minutely divided, by pouring it into water. In filings or small particles, it is used to produce those brilliant stars and spangles which are seen in the best artificial fire works.