Observations on the Connection of the Elements by their Atomic Weights.

BY SEPTIMUS PIESSE, OF LONDON, ENGLAND.

Chemists are acquainted with fifty-five substances which are considered to be elements—that is, to consist only of one kind of matter. Their names are subjoined in the following table, to which is attached certain numbers, said to express the quantities by weight according to which the different elements combine with each other. Oxygen as 100.00.

TABLE OF GROUPS.

Names of Elements.	Atomic Weights.	Names of Elements.	Atomic Weights.
FIRST GROUP.		Osmium......	1244.50
Fluorine......	233.80	TENTH GROUP.	
Chlorine......	442.65	Lithium	80.33
Bromine......	978.31	Magnesium ..	158.35
Iodine.........	1579.50	ELEVENTH GROUP.	
SECOND GROUP.		Alumium.....	171.17
Oxygen	100.00	Manganium..	345.89
Sulphur.......	201.17	TWELFTH GROUP.	
Selenium	494.58	Cobalt	368.99
Tellurium	801.76	Nickel.........	369.68
THIRD GROUP.		Thorium......	744.90
Carbon........	75.00	THIRTEENTH GROUP.	
Boron	136.25	Iron............	321.00
Silicon	277.31	Rhodium	651.39
FOURTH GROUP.		FOURTEENTH GROUP.	
Strontium ...	547.29	Glucinum ...	331.26
Barium	856.88	Palladium ...	665.90
Lead	1294.50	FIFTEENTH GROUP.	
FIFTH GROUP.		Calcium	256.02
Titanium.....	303.66	Cerium	574.70
Tin	735.29	SIXTEENTH GROUP.	
SIXTH GROUP.		Chronium ...	351.82
Molybdenum	598.52	Cadmium	696.77
Tungsten	1183.00	SEVENTEENTH GROUP.	
SEVENTH GROUP.		Zinc	414.00
Sodium	290.90	Vanadium ...	856.89
Potassium....	489.92	EIGHTEENTH GROUP.	
Silver	1351.61	Zirconium....	420.20
EIGHTH GROUP.		Bimuth	886.92
Nitrogen......	177.04	NOT GROUPED.	
Phosphorus ..	392.23	Copper	395.70
Arsenium.....	940.08	Yttrum	402.51
Antimony ...	1612.90	Uranium	1700.50
NINTH GROUP.		Mercury	1265.82
Platinum.....	1233.50	Tantalum	2307.43
Gold	2486.03	Hydrogen	12.48
Iridium	1233.50	Lantalum	

M. Mitscherlich, some time ago, laid down a law which has become generally adopted by chemists, and now forms a fundamental doctrine of physical science. This law is the "Doctrine of Isomorphism," and teaches as follows:—The same number of atoms combined in the same way produce the same crystalline form; and the form of the crystal is independent of the nature of the atoms which compose it, but is determined only by their number and relative position.

This doctrine has been observed with greater generality among substances of a complex constitution, such as salts, in consequence of their appearing more frequently in the crystalline form than otherwise.

When two salts crystalize alike, containing the same base, but with different acids, they are said to be "Isomorphous" salts. In these cases the acids themselves are supposed to be Isomorphous; but this cannot be always proved, because they do not usually crystallize, but their analysis has generally proved them to be of the same composition, when their Isomorphism has been suspected. The elements themselves, in these cases, are supposed to be Isomorphous; and the Isomorphism of the acids and salts are supposed to arise from the Isomorphism of the elements. Again, if a certain number of different bases unite with a certain acid, and form salts which crystallize alike, then these bases are said to be Isomorphous upon the same principle.

Isomorphism has been traced throughout nearly the whole of the elements, and will appear more striking on viewing the groups into which I have divided them in the table. Many of these groups or classes, are, by the Isomorphism of their compounds, so linked or blended together that they form one large family, as it were, they shade into each other like the colors of the prism, and but few distinct classes can be acknowledged.

The elements have been arranged in the table, not only with regard to their Isomorphism, but more particularly to their atomic weights; thus, in a class of two substances, that which has the lowest atomic weight precedes the higher. If three, four, or more substances are classed together (*i.e.*, Isomorphous), the same arrangement is followed. In the first class, as with the rest, the elements are not placed promiscuously, as—

Chlorine..................................	442.65
Iodine.....................................	1579.50
Fluorine..................................	233.80
Bromine..................................	978.31

But this—

Fluorine..................................	233.80
Chlorine..................................	442.65
Bromine..................................	978.31
Iodine.....................................	1579.50

By this arrangement a singular observation has been made—that is, that the atomic weight of the succeeding element is nearly twice that of the preceding, or *vice versa*. If the highest atomic weight be placed first, then of course the suceeding element has only one half the atomic weight of the preceding. This observation has been found to hold good in so many cases that the author is inclined to establish it as a general law.

It must be borne in mind that, as the majority of the equivalents now stand, this law only assumes to an approximation. But to proceed to show this approximations, I shall examine two of the principal groups. The fractional portions will be omitted in the following computations:—

The equivalent of Fluorine is	=	233
This multiplied by		2
will give for Chlorine	=	466
multiplied by		2
will give for Bromine	=	932
multiplied by		2
will give for Iodine	=	1864

There is not the slightest doubt but that the equivalents gained by this calculation are incorrect; it is only made to show how they approximate to the real.

This error, I am induced to believe, arises from taking an incorrect data.

(Concluded next week.)

Concrete Houses.

MESSRS. EDITORS:—I hereby send you the description of a concrete house which I have built for myself, and which is very neat, cheap and beautiful.

The main building is 25x28 feet, and two stories high—the first nine feet, the second eight feet, and there are three feet space between ceiling and roof, which is what is called a hipped roof. It projects eighteen inches, is ceiled underneath, finished with brackets, and covered with spruce plank lined over. I have an addition on the rear (also two stories), 12x14 feet. There is a piazza the full width of front. The interior is divided as follows:—The first floor has dining-room, bedroom, and kitchen; the second floor has two large rooms, with closets between, and three bedrooms. The windows are imitation French, eight lights, 12x15. The walls are ten inches thick in the first story and eight in the second. The materials used n building the walls were shell lime, cement, gravel, broken stone, and pieces of brick. My concrete is made of one part shell lime and eighteen of gravel and stone well mixed. I commenced operations by first digging my cellar the depth I wished to go for a foundation, cutting the sides square, then setting uprights of joists or wall strips all round the distance from the bank that the cellar wall was to be carried up. I then laid down large flat stones and settled them well in the earth; on these I placed my boards, set on edge and back against my uprights, which formed my boxes. In these I laid my wall (the same as any ordinary stone wall) to the top of the boxes; then mixed cement and sand into mortar thin enough to run freely, and poured it in the boxes till they were filled. The thin cement run through all the joints or crevices between the stones and cemented them together in one solid mass. This "set" in three or four hours, and the boards were raised for another course, and so on till the required hight was obtained; mine is six and a half feet.

The floor timbers were then laid in their places; each had a hole bored about three inches from the end, through which a hard wood pin was driven, and projected about three or four inches on each side. These pins serve as anchors for the walls which are built around them. I then used two sets of box boards outside and inside, secured at the bottom by small bolts made of ½-round iron, having a nut on the end. These rods were placed about one inch from the bottom of the board and four feet apart. The edge below the rods shut over the wall below and preserved an equal thickness. The tops were secured by cleets, notched to fit the boards and the thickness of the wall. These boxes I put up all round my wall, so that they formed one continuous trough plumbing it up. They were then filled with the concrete, pressing it well to render it as compact as possible. I then covered it and allowed it to stand for twenty-four hours, by which time it had "set" sufficiently to raise the boxes for another course, which was done by taking off the cleets, unscrewing the bolts, and drawing them through the wall. These bolts answer a double purpose, viz., securing the boxes to the proper thickness, and also supporting them by resting on the walls. The door and window-frames were made the same thickness as the wall, then set in their places, and the wall built around them. My halls, parlors, &c., were plastered and "hard finished" on the main walk, without lathing, and are as solid as marble; the other inside work is the same as in frame houses. The outside was finished with common lime mortar, with the addition of a little cement, or two parts mortar and one of cement; the whole being laid out in blocks to represent stone. When dry, I coated it with clear raw linseed oil. My roof has two coats of Blake's fire-proof paint; and all the woodwork, inside and outside, has two coats of zinc paint and oil, and is varnished.

The whole only cost me about $1,000.

F. G.

Huntingdon, N. Y.

A True Sign of Progress.

The *Commercial Bulletin*, a very sensible and business-like journal published in Boston, says, in reference to Patents:—"They go hand in hand with progress, and the number granted is a fair test of the manufacturing activity not only of districts but of nations. England, France and the United States grant the largest number; while Austria, Russia, and Spain grant the least in proportion to their population. The following is an exhibit of patents granted in four of these countries during the year 1857:—United States, 2,910, or 1 in 7,935 of the population; Great Britain, 2,115, or one 1 in 13,007; Austria, 724, or 1 in 50,434; Russia, 24, or 1 in 2,902,606. A current of invention steadily sets in the direction in which it is urged by passing events, as is proved by the swelling number of applications for patents which relate to the engrossing subject of the hour. When the war with Russia broke out, the British Patent Office was inundated with belligerent projects. No less than six hundred patents have since been granted for military inventions, while the total of all that had ever been granted before was only three hundred."

Rendering Textile Fabrics Waterproof.

Take common glue and soap—one pound of each—and dissolve them in seven gallons of water, raised to the boiling point. When in a state of ebullition add to it, slowly, about one pound of pulverized alum, and maintain the boiling action for fifteen minutes. It is now taken off and cooled down to 122° Fah. and the cloth immersed in it for ten minutes, after which the latter is taken out and dried in the open air. When this is effected, it is washed in cold water, dried again, and then put in a mangle or press, to dress it. The soap for this purpose must be made of tallow. The glue and the animal acids combine with the aluminum of the alum and form an unsoluble substance, which is precipitated in the pores of the cloth.

Photographing on Wood.

The editor of the London *Photographic News*—Mr. Cook—describes a method lately discovered by him for producing photographic pictures on wood, for the purpose of engraving. He first covers the surface of the block with oxalate to which a little gum arabic in solution has been added. This produces a thin coating of the oxalate; after which the block is hid in a drawer to exclude it from light, until it is required for use. It is now taken out and exposed to the sun-light in a frame, under a picture, and when the figure comes out the block may be placed in the hands of the engraver at once, if he does not expose it to the direct rays of the sun. It is stated that diffused light will not blacken it, unless exposed for quite a number of hours to its influence. This process is only adapted for the transferring of pictures to the blocks, and is not so perfect as the American process for taking pictures direct from living objects.

Scientific Farming Memoranda.

Exhausting the Soil.—It is well known that if the same kind of crops are planted or sown for several years in succession on the same soil they will at last cease to yield. This is called "exhausting the soil," for which a partial remedy is found by the use of manures, but even with thorough manuring every season, the soil will fail to yield, if the crops are not frequently changed by what is called "rotation of cropping." To account for this, it is believed that each crop exhausts the soil of the peculiar nutritive matter which it requires, and thus it takes some years to bring back or restore such matter to the land. It is well known that some soils are so rich in certain salts as to be capable of raising a succession of crops for a number of years, but this is not the case generally. A rotation of crops and frequent manuring can alone ensure any soil from becoming exhausted. A grain crop should always be succeeded by a root or a green crop, and *vice versa*. Thus wheat, then grass, oats, potatoes, corn, wheat, turnips, barley, potatoes, rye, clover.

Manures.—Guano is a powerful fertilizer, but it is too concentrated to be used singly. It is found to produce superior effects when mixed with equal quantities of common salt, and then stirred up with about four times their quantity of moist loamy soil. The superphosphates are coming into more general use for root crops, and they are valuable for such purposes. They should be applied as early in the season as possible, as they require considerable moisture to ensure their absorption by the plants. There are many adulterations of guano sold, and as it is an expensive fertilizer, deception in its quality is a heinous crime. In burning Peruvian guano, it should loose from 55 to 60 per cent of its weight; its ash should be white, and dissolve readily without effervescence in dilute muriatic acid leaving an insoluble residue of only about 2 per cent. A bushel of pure guano weighs about 70 lbs.; if adulterated with clay, marl or sand, it will weigh more than this. This latter test will detect gross adulteration; the former a more refined adulteration.

Weeds.—Farmers should be careful not to cultivate weeds, as they steal that nutriment from the soil which should otherwise be taken up by genuine plants. To prevent weeds, great care should be exercised in securing clean seed. In clover seed there are as many as 20,000 weed seeds in every pint. As about from twelve to fourteen pints of seed are sown to the acre, over forty weed seeds are sown upon every square yard.

Seeds.—In seeds, as in live stock, defects are handed down from generation to generation, and constant care is therefore required to remove any hereditary taint. Seeds from blighted straw should never be used, because this is an indication of disease, and yet this feature is not sufficiently understood. Some farmers entertain the idea that shriveled wheat and corn will do well enough for seed; this is an unscientific and incorrect notion. The very soundest seed, and nothing else, should ever be sown.