A SIMPLE APPARATUS FOR ILLUSTRATING THE ATOMIC THEORY.

There is probably nothing in the whole range of science which teachers have found more difficult to explain to their pupils than the law of chemical combination, and yet, by adopting the method of explaining the theory first and then stating the facts on which it is founded, and by using the little balls which Dalton originally employed to impart his ideas to his cotemporaries, there is nothing in the compass of human knowledge which is more easily understood. Indeed, it is the wonderful simplicity of this great law which excites the admiration of all who have examined it. It is the purpose of this article to suggest a slight modification of the simple balls of Dalton, and to call the attention of the numerous teachers among our subscribers to this apparatus, which will render a difficult matter exceedingly plain to the comprehension of their scholars.

Make three small balls of the same size, but of different materials, so that their weights may vary. Take the lightest substance possible, say the pith of elder or of corn-stalk, to represent the atom of hydrogen. Some substance a little more than six times as heavy as the hydrogen ball—perhaps cork—will answer for an atom of carbon, and some light wood fourteen and a fraction times heavier than the hydrogen will furnish the ball to represent an atom of nitrogen. The oxygen atom will be just half the size of the others, and of a substance to make it, though of half the size, eight times heavier than the hydrogen. This is Dalton's apparatus, of course extended to 64 balls of various weights to represent the 64 elements of which all matter, so far as we now know, is composed. The addition which we suggest is to represent the force of chemical affinity by a thread for drawing these several balls together. Provide a considerable number of the hydrogen balls, of the oxygen, &c., and then by fastening them together with a needle and thread in the proper groups, how easy it is to illustrate the several chemical combinations by which the great multitude of substances with which we are acquainted are produced! Of course the balls should be marked with the initials of the elements for which they stand, the hydrogen with H, the oxygen with O, the iron or ferrum with Fe, and so on. Fasten together an atom of hydrogen and an atom of oxygen, and the pair makes an atom of water. Produce a number of these pairs and place them in a cup, and the cabalistic characters (H O), which have so puzzled the boy's head, immediately become as plain as the initials of his own name. He sees that they stand for one atom of hydrogen and one of oxygen chemically combined, producing one atom of water, and that, in water, the oxygen weighs eight times as much as the hydrogen, and occupies one half the space.

Again, fasten two atoms of oxygen to one of hydrogen and we have an atom of the deutoxyd of hydrogen (H O2), that sirupy liquor in which the oxygen weighs 16 times more than the hydrogen and occupies precisely the same amount of space. The elementary constitution of all known substances may thus be clearly represented, and in a few hours exercise, the whole law of chemical combination may be so plainly displayed to a child's mind that he will wonder that any one ever found any difficulty in understanding it, and so forcibly impressed that he can never forget it. Of course, it is proper that he should be told that no one has ever seen one of these atoms; that if they exist at all, they are so small as not to be perceptible even by the miraculous power of the compound microscope; that, in short, the whole thing is a theory, which is universally regarded as probably true, because it explains all the known phenomena of chemical combination. The proportions of the elements in chemical combinations do always correspond with the atomic weights. For instance, neither seven nor nine ponnds of oxygen will combine with one pound of hydrogen, but either 8 13-000 lbs., producing water, or 16 26-000 lbs., producing deutoxyd of hydrogen.

It should be explained also that the form or forms of these atoms are wholly unknown. They may be globular or square, or wedge-shaped, or cylindrical, or of any other conceivable form, for aught we know. There are some facts in the connection of electricity with chemical affinity which we have thought might be explained on the hypothesis that the atoms are in the form of cylinders, perhaps short ones like coin. The pieces of wood, pith, &c., to represent the atoms, might be made in this latter form instead of balls, especially as in the form of coin they could be very conveniently fastened together.

SIMPLE EXPERIMENTS IN NATURAL MAGIC.

Edward S. Browne, of Commack, N. Y., has sent us a batch of simple but interesting experiments in natural magic, for the amusement and instruction of our juvenile readers, and perhaps also some of the old ones. A few of these philosophical pastimes will be found described below; the others will appear next week.

OPTICAL AUGMENTATION.

Take a large drinking glass of a conical figure, in which put a silver coin, and fill the glass about half full with water; then put over it a plate and invert both quickly, that the water may not escape. You will then see on the plate a piece twice the size of the original coin, and, somewhat higher up, another of the original size. This phenomenon arises from seeing the piece through the conical surface of the water at the side of the glass, and through the flat surface at the top of the water, at the same time; for the conical surface dilates the rays and makes the piece appear larger; but by the flat surface the rays are only refracted, by which the piece is seen higher up in the glass, but still of its natural size. That this is the cause will be farther evident by filling the glass with water, for, as the coin cannot then be seen from the top, the larger piece only will be visible.

After you have sufficiently amused yourself with this remarkable phenomenon, you may give the glass to a servant, telling him to throw out the water and keep the two pieces of money; and if he suspect nothing, he will be not a little surprised to find one piece only.

ALTERNATE ILLUSION.

Through a convex lens of about one inch focus, look attentively at a silver seal, on which a cipher is engraved. It will at first appear cut in, as to the naked eye, but if you continue to observe it for some time, without changing your situation, it will seem to be in "relief," and the lights and shades will appear the same as they did before. If you regard it with the same attention still longer, it will again appear to be engraved; and so on alternately.

If you look off the seal for a few moments, when you view it again, instead of seeing it as at first, it will appear in relief.

If while you are turned toward the light, you suddenly incline the seal, while you continue to regard it, those parts that seemed to be engraved will immediately appear in relief; and, if, when you are regarding these seeming prominent parts, you turn yourself so that the light may fall on the right hand, you will see the shadows on the same side from whence the light comes, which will certainly appear extraordinary. In like manner the shadows will appear on the left if the light fall on that side. If, instead of a seal, you look at a piece of money, these alterations will not be visible, in whatever situation you are placed.

It has been suspected that this illusion arises from the situation of the light, and, in fact, M. Guyot observed that when he viewed it with a candle on the right, it appeared engraved, but, by changing the light to the left side, it immediately appeared in relief. It still, however, remains to be explained why we see it alternately hollow and prominent, without changing either the situation or the light. Perhaps it is in the sight itself that we must look for the cause of the phenomenon; and this seems the more probable as all these appearances are not discernible by all persons.

A SIMPLE, POWERFUL MICROSCOPE.

Make a circular hole in the shutter of a window which looks on open ground, and in this hole place a convex glass, either simple or double, whose focus is at the distance of five or six feet, the distance should not be less than three feet or the images will be too small, and there will be little room for the spectators. On the other hand, the focus should never be more than fifteen or twenty feet, for then the images will be obscure. Take care that no light enter the room but by the lens. Let the rays of light that pass through the lens be thrown on a large concave mirror, properly fixed in a frame. Then take a slip or thin plate of glass, and sticking any small object on it, hold it in the incident rays, at a little more than the focal distance from the mirror, and you will see on the opposite wall, amidst the reflected rays, the image of that object, very large and extremely clear and bright. This experiment never fails in giving the spectator the highest satisfaction.

WHO GETS THE PATENT OFFICE REPORTS?

MESSRS. EDITORS:—Can you, through the columns of the SCIENTIFIC AMERICAN, inform inventors how any one of them may procure a copy of the Patent Office report? Congress has appropriated large sums for printing thousands of copies for public distribution. The original design of this expenditure was certainly intended to benefit the inventor, and through his untiring energies and exertion, bring back an abundant harvest into the public treasury. Has this design been carried out? is a question that needs no answer here. A few copies only are granted to the Commissioner, and when an inventor asks him for this favor, he is compelled to answer, "No copies for distribution." He then applies to the member of Congress from his district, who, perhaps, not knowing his politics, thinks "it won't pay" to send one of "our documents" without knowing who is going it. Every inventor should enter his solemn protest against these abuses; and as the SCIENTIFIC AMERICAN is taken as his text-book and guide, I look upon it as the only proper place to commence the warfare. J. R. G.

Louisville, Ky., July 2, 1860.

[In reply to the above inquiry, we can only say that the remedy for the grievance complained of rests solely with Congress. A limited number of the reports are left with the Commissioner of Patents. His practice is to furnish a copy to each inventor who has obtained a patent during the year embraced in the report. Those which are left are distributed in such a way as is thought likely to best promote the general interest, giving a preference to libraries and other public institutions. The whole number of those who are each entitled to a copy of the reports, in accordance with this rule, is some five thousand annually. It will therefore be readily perceived that the Commissioner has a sufficient excuse for not being able to accommodate the large number of those who are constantly reqesting this favor. We have no doubt but a much better arrangement than that heretofore followed might be made by having a much greater proportion of these reports to be distributed by the Patent Office. This course has been long advocated by us. But perhaps it is too much to expect anything in the nature of such a self-denying ordinance from our legislators. The distribution of these documents furnishes a convenient method for them to confer favors which will at least be regarded as compliments by those who receive them, whether they ever read a page in them or not. The only remedy we can suggest, therefore, is to recommend to every inventor to try to elect such members of Congress as will use their privileges for the purposes for which they were intended, by distributing Patent Office reports to those would prize and use them, rather than by distributing them in payment of the services of political recruiting-officers, who make no more use of them than a horse would of a handsaw.—EDS.

QUICK WORK.—Some days ago the appearance of flour from new wheat in the Augusta (Ga.,) market was noticed. Its movements from the field to the channel of commerce are worthy of a record, showing that we of the South can be as fast as the Yankees, when we have a mind to. On Thursday morning that wheat was standing in the field, on the farm of Dr. Daniel, opposite this city. It was cut, thrashed and winnowed, and sacked on that day, brought to Savannah, and taken by the night train 130 miles, to Stovall's Excelsior Mills, at Augusta, where it arrived early on Friday morning. By two o'clock that day it was ground, the flour bolted, re-sacked, and on the cars for Savannah, arriving here by the 10 o'clock P. M. train, having undergone all these changes, and traveled 260 miles in less than 48 hours; but this is not all. Early next morning (Saturday) 20 sacks of it were on board the steamer, and will be in New York in time to be served up by the hotels at breakfast on Tuesday morning! We have thus five days for the whole operation, including some 1,100 miles of travel.—*Savannah Republican.*

A VARNISH FOR IRON-WORK.—To make a good black varnish for iron-work, take 8 lbs. of asphaltum and fuse it in an iron kettle, then add 2 gallons of boiled linseed oil, 1 lb. of litharge, ½ lb. of sulphate of zinc (add these slowly or it will fume over), and boil them for about three hours. Now, add 1½ lbs. of dark gum amber and boil for two hours longer, or until the mass will become quite thick when cool. After which it should be thinned with turpentine to the proper consistency.