[For the Scientific American.]

Photographs and Stereoscopic Angles—The True Theory.

A communication appeared in No. 5, this Vol. Scientific American, with the above heading, the doctrines of which appear so monstrous, that, were it not for the high position the author occupies in the daguerrean art, I would not have seen fit to controvert them. I have come to the conclusion, after perusing this article carefully, that the author has not studied, nor does not understand the article which I had the honor to contribute to your valuable journal on page 251, Vol. 10. I have there proven that stereoscopic pictures, possessing all the stereoscopic relief to which they are, by nature, entitled, can be taken from two points of sight, distant from each other only 2 1-2 inches, or the same distance the human eyes are apart, without having recourse to Messrs. Southworth & Hawes' patented arrangements, the fallacy of which, I supposed, would, ere this, have become apparent to the inventors themselves, or I should have given the subject more than a mere passing notice in my article alluded to.

The human eyes can only coalesce objects that are parallel to the base of vision, and they cannot coalesce vertical and horizontal objects of the same picture at one and the same time, (the implied assertion of Mr. Southworth to the contrary, notwithstanding.) He makes this strange assertion, "that the human eyes, in one fixed position, do not see objects correctly." If this were true, I would ask Mr. Southworth if he does not believe the Creator, in his infinite wisdom, would have placed one eye in its present position and the other in the place now occupied by the bump of causality?

That Mr. Southworth has read inattentively, is evident from the allusion which he makes to a paper read by Sir David Brewster before the British Association for the Advancement of Science, and illustrated his theory by experiments, attempting to prove that "the distortions universally noticed in stereoscopic pictures was caused by using lenses larger than the lens of the eye," &c. Now any person that will take the trouble to obtain and read the article of Mr. Brewster's, which originally appeared in the report of the British Association for 1852 and 1853, and which I find is the same that I alluded to on page 358, Vol. 10, of your journal, they will find that not one word is said in the whole article about stereoscopes at all!

Let Mr. Southworth take a 1-4 size daguerreotype plate and draw a line lengthwise upon it in such a manner that the line will divide the plate into two equal portions, and fix a pin say four inches long, perpendicular, upon the middle of said line, then take, by means of his patented arrangement, a stereoscope picture of the plate so arranged, in such a manner that the resulting pictures will be as large as will fit a one-quarter sized stereoscope, he will find that by looking at the picture through the stereoscope it will be impossible for him to coalesce the two pins on the pictures into one (which they will do, however, if the pictures are taken in the manner pointed out by me on page 251,) and the reason why they do not do so, is perfectly obvious, from the fact that the upper ends of the pins do not (in the picture) fall upon the line of the arranged plate; the base of the pins do, but the tops do not; whereas, if the pictures are taken either in the ordinary, or in the manner pointed out by me, both the base and the top of the pin will fall upon the line.

The human eye possesses the power of coalescing pictures situated parallel to the base of vision, to the extent of 37 1-2 degrees, and they can, and do see one and the same object naturally, under every angle of convergence, from 37 1-2 to 0 degrees, simply by viewing the object at a greater or less distance from the eye; but they cannot coalesce pictures situated vertically to the eyes. They can combine pictures taken vertically, that is to say, by two cameras, one immediately above the other, just as well as those taken horizontally, that is, if they are put into the stereoscope in a laying or horizontal position. In that case a picture taken of a man, for example, while standing, would, when properly put in a stereoscope, appear, in that instrument, as if he were lying down; but there is no compromise between the vertical and the horizontal position.

Writers on binocular vision have always spoken of the eyes as if they possessed no compensating power for the loss of stereoscopic relief of distant objects. The fact, however, is, that they *do* possess such power to a considerable extent, which they exercise by means of two very ingenious contrivances. The first is the ball and socket joint of the eye, by means of which they move further apart for distant than for near objects, thereby increasing the angle of vision. The other is, they possess the power of contracting their aperture, and they do so when viewing distant objects. Now I have established the fact in the article before alluded to, that the stereoscopic relief of pictures is increased by a diminution of the aperture of the lense, and consequently the contraction of the diaphragm of the eye also increases the stereoscopic effect. Hence it is that we find in small insects not only small eyes, but also that they are situated close together. Their sphere of vision is comparatively limited, from the very fact of their eyes being small, and objects to us invisible become visible to them. Their eyes are natural microscopes—ours natural telescopes. If our eyes were no larger than a mathematical point, the most minute atom of matter would be visible to us.

In conclusion, I may state that I speak from experience, having, as soon as Messrs. S. & H.'s patent was issued, taken a picture according to their claim, which picture possesses the fault one might naturally expect, namely: if the two pictures are placed in the stereoscope in such a manner that the four eyes of the portraits are parallel to the sides of the case, the rounds of the chair upon which the person sits, will not be parallel, producing a strain and contortion to the eyes of the observer in their endeavor to assimilate this unnatural picture. This contortion is somewhat similar to what takes place when viewing ordinary stereoscopic pictures, that have not been put up parallel—an occurrence that often takes place in the hands of the inexperienced or careless artist. I have very frequently met with pictures which were put up, one at least a quarter of an inch higher than the other. Indeed, it is not unusual to meet with pictures in the rooms of some of our best artists, which are put up stereoscopic *reverse*, that is, the right picture where the left one should be, and *vice versa*. How is it possible to see such pictures correctly?

John F. Mascher.

Philadelphia, Nov. 14, 1855.

British Association for the Advancement of Science.—No. 1.

The above association held its Annual Meeting, this year, in the latter part of the month of September, in the city of Glasgow, and it has been generally acknowledged to be the best ever held. In a series of two or three articles, we will endeavor to present an abstract of some papers read before it, which, we believe, possess an interest for our readers.

Alloys of Metals—Amongst the papers submitted to the meeting in the department of Practical Science, was an important one on some alloys of iron and aluminum, by Professor F. Crace Calvert, of Manchester. The experiments on the subject had been undertaken with the view of solving one of the great chemical and commercial questions of the day, namely, that of rendering iron less oxydizable when exposed to a damp atmosphere. Professor Crace Calvert, in conjunction with Mr. Richard Johnson, had succeeded in producing two new alloys, composed of iron, combined with that valuable metal lately obtained by M St. Claire Deville—aluminum. These two alloys are composed as follows: First, 1 equivalent of aluminum, 5 equivalents of iron; second, 2 equivalents of aluminum, 3 equivalents of iron; and the last alloy possessed the useful property of not oxydizing when exposed to a damp atmosphere, although it contains 75 per cent. of iron. Messrs. Crace Calvert and Johnson hoped to discover, before the association next met, a practical method of preparing this valuable alloy, which would render essential service to arts and manufactures. The following alloys were also described: One composed of 1 equivalent of aluminum and 5 equivalents of copper; one other of iron and zinc, composed of 1 equivalent of iron and 12 equivalents of zinc. This last alloy is not only interesting from its extreme hardness, but it is produced at a temperature of about 800 deg., being formed in a bath of zinc and iron, containing 14 tuns of metal, through which iron wire is passed, when coated with zinc, or galvanized. The action of acids on those alloys was stated to produce this curious fact—that, although hydrochloric acid violently affects zinc and tin in alloys containing those metals, with copper they are but very little affected by this powerful acid, and similar results with sulphuric and nitric acids.

Fire Arms—On their Length, Bore, and Composition—W. B. Adams read a paper on artillery and projectiles, which attracted much notice, the object of the author being to establish the importance of the length of the bore in proportion to the diameter, and the propriety of increasing length rather than diameter, with a view to more extended range. Long guns were more difficult of construction than short ones, but the American rifle proved the advantages of length, by which were obtained, first, greater certainty of aim; secondly, greater truth of direction; and thirdly, expansive action of the powder, in addition to the mere explosive force following up the projectile, instead of being wasted in the air. Reasoning by analogy, if the American rifle was right, modern artillery was wrong. It had been shortened for convenience of weight in transport, and to save space on shipboard; and it was sought to compensate the advantages thus lost by increasing the strength, and the quantity of powder. Mr. Adams urged the necessity of using breech-loading guns, and suggested that, in steam vessels, streams of water could be driven through them, to cool them down when heated.

Professor Robinson observed, that the exact flight of a projectile, that it may with more certainty strike the object, could only be attained by making it rotate in its flight. To effect this by any external wings or curved grooves was impossible, as it was well known that there is a certain mass of air carried always along with the shot, which prevents any external spiral from producing the desired effect. In a 24-pounder, the pressure of explosion is 72 tuns on each square inch, which is ten times the force of the tensile resistance of a square inch of the metal. The additional strength is obtained by the greater thickness of the iron forming the breech, and which gradually diminishes towards the muzzle. Every discharge changes the form and structure of the gun. The force required to give the rotatory motion to a ball is equal to one-half of the simple projectile force; and hence, while a shot from a plain bore is projected with a velocity of 1500 feet per second, that from a Minie rifle is not more than 900 feet. It was clear that cast-iron was not the best material, as it had not sufficient power to resist repeated percussive action, and the attempts to make guns of wrought-iron had failed. The older guns were made of bronze, and it was rather singular that the guns which Mahomet II. had made of that material were still at the Dardanelles, where they had been used with great effect. They had a bore of 3 feet, and were fired with a charge of 200 lbs. of powder, projecting an enormous granite ball, a yard in diameter. If the Turks could formerly cast cannon to stand such a charge, is it not strange that we cannot now surpass them?

Mr. Fairbairn observed that most of the iron of which our guns are now made is inferior to that in use some years ago. He had recently been at Woolwich, where some experiments with malleable guns had been made, but they failed; and it is necessary, therefore, that the metal should be solid. All the guns were now cast solid, and then bored out; but the unequal cooling of such a large mass of metal forms a varied granulation, which is not so strong in the center as at the outside. The Americans still follow the plan, which, it was remarked, was adopted more than a century ago in this country, of casting all their guns with a core; they then run a current of cold water down the center, which cools the metal inside and outside more equally. With regard to the length of guns, Mr. Fairbairn observed that the 13-inch mortars at present in use, should be at least 1 foot longer, as 50 lbs. of powder would have more effect, because its force was exerted for a longer time upon the shell than 60 lbs. with the shorter bore. The form of the mortar was also objectionable, as the thickness of the metal was the same at the muzzle as immediately above the chamber, while it would be better if the thickness were diminished at the muzzle, and increased at the breech. With regard to the durability of guns, he remarked that those of ordinary caliber were supposed to stand from 600 to 700 rounds, but they always give way at the vent or touch-hole, which became conical; but, by putting a tube in the bore, they were found to stand about 700 rounds more. The Russian iron ores were chiefly magnetic, and made excellent guns, while almost all the Turkish ordnance was made of gun-metal, a mixture of copper and tin. There was great difficulty in making guns in parts, as every explosion changes their relative position; he, therefore, preferred casting them perfectly solid.

Purifying and Softening Hard or Lime-water—Dr. Campbell read a paper on this subject, describing the process of Dr. Clark, now in use in many places in England. This process for softening water may be applied with advantage to water from the chalk strata, water from the new red stone, and waters which contain carbonate of lime in solution from any strata. It is briefly described as follows: namely, by adding a quantity of quicklime to the water, it takes carbonic acid holding carbonate of lime, throwing down at the same time the quantity of carbonate of lime held in solution by the carbonic acid, and thus renders the water soft. The works and operations for carrying out the process were fully described. One peculiar feature in the water after it has been softened, and which was not anticipated by Dr. Clark when he first took out his patent, is, that it does not show the slightest sign of vegetation though exposed to the sun and light for upwards of a month, whilst the water before softening can not be kept above a few days without producing Confervæ; and if this be not immediately removed, decay commences quickly, and small insects are soon observed, which feed upon the decaying vegetable matter, and the water soon assumes a bad taste. This is continually the case when the water is kept in large reservoirs, and its removal occasions considerable trouble and expense. The author had endeavored to explain the reason of this marked difference between the unsoftened and the softened water; and he was nearly satisfied that the vegetating principle in the water was more especially due to the carbonic acid holding the carbonate of lime in solution than to the volatile matter, or, as it is sometimes called, organic matter. The process is applicable to many towns already supplied with waters from the New Red Sandstone, and if properly applied will be found to pay the expense of its working, and confer a great boon upon the populations, the enlightenment of whose corporations may induce them to adopt it.

Solvents of India Rubber and Gutta Percha.

Messrs. Editors—The usual solvents in the manufacture of these articles are camphene, rectified naphtha, and spirits of turpentine; and in the laboratory bi-sulphuret of carbon, alone or with alcohol, caoutchoucine, chloroform, &c. According to M. Payen (whose essay on gutta percha and india rubber, Paris 1851, contains the best information on the subject, chemically considered, yet published,) the very best solvent is the sulphuret of carbon, with alcohol anhydrous (absolute,) in the proportion of 6 or 8 of the latter to 100 of the former. This process was patented in France by M. Gerard, of Grenelle, on the 24th Sept., 1849, and differs from the action of the ordinary solvents inasmuch, that whereas these last swell the rubber and dissolve a portion only, the former dissolves the entire mass, and while to the manufacturer it is objectionable on the score of expense, and from its excessively inflammable nature, to the experimental chemist it leaves absolutely nothing wanting to the production of a perfect solution. J. T. S.

New York.

The mechanics of San Francisco have formed a Mechanic's Institute, which promises to be useful. It now numbers 216 members, and a library has been started with every prospect of success in raising a first rate one.