Notes on Aluminum.

From a large number of experiments made by the author, the following results have been obtained:

Alloys Containing Gold.—Alloys of aluminum and gold, although interesting, are of little practical use except for decorative purposes. With 6 per cent of gold, the alloy is as white as pure aluminum, but more brittle; and with 10 per cent the product has a light violet brown color, is harder than aluminum, and only works well at high temperatures. A 15 per cent gold alloy is almost white, with a violet shade, very soft, and a fine grained metal. An alloy of 50 per cent gold is soft and spongy, and possesses a beautiful violet color; while with 78 per cent of gold it is very brittle, and of a pinkish violet color. With 90 cent of gold, the color is a pale violet, and with 94 per cent it approaches a pink. Alloys containing small percentages of aluminum leave a bright violet color on the cupel under the blowpipe. An alloy of 50 per cent of gold, 45 per cent copper and 5 per cent aluminum takes the color and polish of 14 carat gold, but easily tarnishes.

Alloys Containing Silver.—Alloys of aluminum with 4 to 8 per cent of silver are harder than pure aluminum, and not brittle, and take a fine polish. The color is similar to that of fine silver; they are used for medals, charms, etc.

Alloys Containing Nickel.—An alloy of 50 per cent nickel and 50 per cent aluminum is of a dull gray color, very porous, and too brittle to use. The following alloys of copper, nickel, and aluminum are very strong, hard, and fine grained: With 66 per cent of copper, 24 per cent of nickel, and 10 per cent of aluminum an alloy is formed which takes a fine polish, and has the color of 10 carat gold. With 55 per cent of copper, 33 per cent of nickel, and 12 per cent of aluminum the color is a beautiful golden brown; and with 72½ per cent of copper, 21¼ per cent of nickel, and 6¼ per cent of aluminum, the color becomes richer and deeper.

Melting of Aluminum.—The temperature should be kept even, and not much above the melting point of the metal, which should be fed into the crucible in small pieces. The most useful flux is a little tallow. A crucible mainly of siliceous material must not be used, as the aluminum attacks the silicon. In alloying, the aluminum is put into the crucible after the other metals have become liquid.

Restoration of the Mat.—Aluminum can be cleaned and its mat restored by dipping for 1¼ minutes in a solution of 3 ounces of caustic potash or soda in a quart of water, then washing well, and dipping in a solution of three parts nitric and three parts sulphuric acid (by volume).—G. F. Andrews, J. Amer. Chem.

The Wonders of the Joints.

Dr. J. H. Hanaford, in the Phrenological Journal for May, gives the following interesting facts relative to a most important function of the human body:

The more than two hundred bones of the body would be of but little service to us aside from their joint connections. Some of these are of a remarkable character.

The twenty-four ribs are attached to the spine by a kind of immovable joint, the seven upper ones to the breast bone, by cartilages; three, more movable, are tied to each other and then fastened above, while four are "floating ribs;" these, with the six above, affording elasticity and motion in the act of breathing, accommodating themselves to the varying size of the chest.

In the place of these ribs a solid plate of bone would be cumbrous, heavy, not admitting of the motions needed at this part, while the curved and elastic ribs afford similar protection to the organs within. The wedge-shaped bone of the lower spine fits firmly into a corresponding cavity in the hip bone—a grand foundation bone of great strength, admirably adapted to its use.

Of the two other kinds of joints, the "ball-and-socket" and the "hinge," much might be said if space would admit. The ball-and-socket is well represented by the joint at the shoulder, which allows the arm to move in all needed directions.

That the arm may have a wider scope, the socket is very shallow, so that when "out of joint" it may be easily put back again, almost by the unfortunate boy, if he only understood the matter. (It would not be safe for him to attempt to walk on his hands, instead of his feet, as the "ball" would slip out too easily for safety.) In this respect the hip joint differs, the socket being quite deep, at the bottom of which there is a round, strong cord, which is so attached to the thigh bone as to prevent dislocation, unless from a severe accident. In consequence of this depth the leg is not afforded much movement, its principal movement being that of walking—a boy need not kick! This depth is needed to bear the weight of the body, with that of burdens which must be carried, in active life. This "ball" cannot get out without breaking the cord, in which case it is useless to put the "ball" back. In the case of a dislocation, the "ball" being pressed up, nature (God in nature) by the aid of the nerves, blood, etc., performs a miracle, making a "socket" around this "ball," so that, after awhile, one can walk tolerably well, always limping, however, because the leg has become shorter than the other.

The other joint is the "hinge joint," like that of the common door, admitting of motion only forward and backward. In the case of the arm, which demands so many motions, the two joints are supplied, making the limb wonderfully useful, adapting it to various, if not numberless, employments. Think of the friction of walking naturally resulting from our motions, particularly of the bones of the leg and thigh, caused by the weight of the body! Indeed, if these were made of steel, without any means of lubrication, only a few years would be required to wear them away so that a man would be cut down to one-half his height. To prevent this, the ends of the bones are provided with a smooth, gristly matter, which is repaired as fast as it wears away, the joint supplying its own oil, with no care on our part. Thus the wonderful machinery of the body goes constantly on.

INSTRUMENT FOR PLACING TORPEDOES.

One of the indispensable danger signals used on railroads is the torpedo, which is exploded by the passing train, but to place the torpedo on the track in position to be acted on by the wheels of the train to be signaled, it has heretofore been necessary to stop the train leaving the signal to enable a man to place it in position on the rail.

Mr. James D. Seamands, of 623 Buena Vista Street, San Antonio, Texas, has recently patented a very simple device by means of which the torpedo may be placed on the rail by a man on a moving train. The complete instrument is shown in Fig. 1. In the tubular end of a long handle is placed a spring pressed follower, carrying at its lower end a foot of soft material, such as rubber, which rests on the upper surface of the torpedo. The latter, which is of the usual description, is furnished with a spring capable of embracing the head of the rail when allowed to assume its natural shape. The spring is held in an extended position by the downwardly extending arms of the instrument, as shown in Fig. 1.

SEAMANDS' TORPEDO PLACER.

The operator grasps the handle and carries it in position to hold the torpedo-supporting spring over the head of the rail. By a quick downward pressure the handle is disengaged from the torpedo spring, which instantly contracts and embraces the rail head, as shown in Fig. 2. Figs. 3 and 4 are enlarged sectional views clearly showing the construction.

World's Fairs in 1896.

Two countries will hold world's fairs in 1896, one in the old world and one in the new. The Exhibition of Industries and Fine Arts which will be opened April 2, 1896, near the castle of Chapultepec, city of Mexico, will be of special interest to Americans. Under the enlightened rule of President Diaz, Mexico has had an opportunity in the last few years to cultivate her great resources, and is now in a position to look for purchasers of her products and bid for the articles she requires. She needs agricultural and mining machinery, printing presses, pianos and canned goods as well as thousands of other articles which the United States is in a position to supply in return for her minerals, cereals, fruits, and coffee. Important inducements are offered to exhibitors, such as the importation of goods in bond and low transportation rates. Senor Ignacia Bejarano, the official mayor of the federal government, is acting as director-general. California, Oregon, Nebraska, Kentucky and Iowa have already appointed State commissioners to look after their interests and a stock company has been organized in Chicago to build the exposition palaces.

An industrial exposition will be held in Berlin in 1896. Special reference is to be paid to exhibits which shall illustrate the history of firearms. One of the features will be an exposition of sports, including a museum of rare objects of the chase and hunting trophies. A dog show will also be held.

BY means of the quadruple effect distilling apparatus thirty-six pounds of water may be evaporated with one pound of coal.

Lightning Freaks.

As the season for lightning flashes is upon us, it may be well to call attention to one or two points and to urge their careful observation and study. The camera has added greatly to our knowledge of these interesting phenomena, and every one in a position to do so should aid in photographing these flashes. We have the multiple flash, the dark flash, the ribbon flash and so on, and these have caused widespread discussion.

Some photographs show a series of parallel flashes following precisely the same path at some distance apart. That separate discharges can make such similar paths for themselves side by side seems incredible. In July, 1892, on an exceedingly hot afternoon at Bay Ridge, Md., a violent thunder storm passed quite near my point of observation. At one point in the storm I saw flash after flash in exactly the same path. There were four or five of these flashes and the whole display lasted more than a second. If a camera were moved very rapidly over such a display, it might give the many distinct parallel flashes, and if it should be moved with less speed, such a broad ribbon flash as is illustrated in La Nature for March 2 might be secured. This "poly flash" or "poly phleg" (Greek, many and flash) should receive some designation to distinguish it from the so-called "multiple flash."

Observations of lightning with the unaided eye may add a good deal to our knowledge. It is highly probable that the estimates of the duration of an ordinary flash of 0·002 to 0·0001 of a second are far too small. It is certain that no broadening of a single flash as sudden as that could ever be had upon the swiftest moving camera. To the unaided eye most single flashes are not more than 0·01 of a second. It is also entirely possible to follow the direction of motion of a flash in the sky.

On April 13, 1895, while a thunder storm was passing directly overhead, I observed a sharp lightning stroke, and, simultaneous with the sound of the thunder, which came four or five seconds later, there was an unmistakable increase in the air pressure. This was not due to the wind, as the air was still at the time. It may be of a good deal of value to obtain additional observations of this kind. H. A. HAZEN.

Cycling and the Heart.

The Popular Science Monthly for May condenses from a lengthy paper on bicycling by Dr. B. W. Richardson, who represents cycling as differing from other exercises, in that it tells primarily and most distinctly upon the heart. It produces at once a quickened circulation, though the riders may not be conscious of it; and this accounts for the astonishing journeys a cyclist can undertake, and his endurance as against sleep. Although the heart increases in action and sometimes undergoes enlargement, the author has never seen a rider embarrassed by overstrain of it, faintness, breathlessness, angina or vertigo, so as to oblige him to dismount. Indeed, he had known a practiced rider who climbs hills on his machine, but could not mount a flight of stairs on his feet without breathlessness and a slight palpitation; he had never seen a sudden death from cycling. He had met with instances in which, after several years of cycling, there was evidence of heart disease, with general languor and inability to sustain fatigue if exercise were again tried on the machine; and, on the other hand, he had known examples in which even an octogenarian had kept up the exercise in a moderate degree apparently with benefit to the circulation. He had seen in some cases apparent benefit arising from cycling even where there was an indication of some disease affecting the circulation, and had known good to arise from it in cases of varicose veins and of fatty degeneration, and in conditions of anæmia. In other cases excessive cycling had been a definite cause of injury to the circulation. The author believes that cycling in moderation may be permitted and even recommended to persons with healthy hearts; that it is not necessary to exclude it in all cases of heart disease, while it may be even useful where the action of the heart is feeble and signs of fatty degeneration are found; that, as the action of cycling tells directly upon the motion of the heart, the effect it produces on that organ is phenomenally and unexpectedly great compared with the work it gets out of it; that the ultimate action of severe cycling is to increase the size of the heart, to render it irritable and hypersensitive to motion; that the overdevelopment of the heart affects in turn the arterial resilience, modifies the natural blood pressure, and favors degenerative structural changes in the organs of the body generally; that in persons of timid and nervous natures the fear incidental to cycling is often creative of disturbance and palpitation of the heart, and should be taken account of; that, in giving advice, it is often more important to consider the peripheral conditions of the circulation than the central; that venous enlargement is often rather benefited than injured by cycling; and that straining to climb hills and meet head winds, excessive fatigue and alcoholic stimulants should be avoided, and the proper number of meals of light, suitably selected food should not be neglected.

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