## PLATING WITH ALUMINUM.

[From the *Deutsche Industrie Zeitung*. by Dr. Clemens Winkler.]

Seventeen years have passed since H. Daville first produced aluminum on a commercial scale; but the expectations regarding this very interesting and meritorious invention of the distinguished French chemist have not as yet been fulfilled. Although many of those expectations were somewhat exaggerated, they were not and are not so unreasonable as many people believed them to be; for a metal with so many valuable properties would be useful in many of the technical arts. Among these properties are a beautiful color that does not change in the air, nor yet in sulphurous exhalations, and further, remarkable lightness, an agreeable resonance, and a capability of being worked into any shape. Moreover, in the use or manipulation of aluminum, there have not hitherto been observed any deleterious effects.

It is generally conceded that the cost, and not the absence of properties which make other metals valuable, has prevented the more extensive application of aluminum; and the price, although it is considerably less than it was at first, has remained high during the last few years. The cost of production of this metal, which can only be effected by the use of sodium, cannot possibly be the only cause of its high price; for the commercial manufacture of sodium may be considered as a solved problem, and, as soda ash is very cheap, sodium might be produced at a moderate cost if the demand were greater than it is. Large production is caused by large consumption, and the use of aluminum has been hitherto limited, mainly because custom and use have opposed the introduction of such a novelty. Stories have been told and written about poisoning by cooking vessels made of copper, by glazings containing lead, and the formation of verdigris on spoons of (alloyed) silver; and if people were only determined to produce these utensils from aluminum, all danger from poisoning would be removed, and they would have vessels the appearance and durability of which would scarcely leave anything to desire. They would be more convenient to handle than our light crockery ware, for they can be made as light, and, what is important, cannot be broken. Splendid pitchers, plates, goblets, lamps, etc, might be manufactured from deadened and embossed aluminum; and the lightness of spoons of this metal would make them more convenient than those of silver now in use. It is rather surprising that they have not yet been more commonly introduced, for people are generally more particular as to their spoons and forks than as to any other table utensil. In this case, it is not the price, but only prejudice, which presents itself as a drawback, for the price is only half of that of good silver; besides, the difference in the specific weights of both metals and the consequent cheapness in the use of aluminum are so great that, for the value of one silver spoon, at least seven equally large aluminum spoons might be bought. True, aluminum is neither a rare nor a noble metal, but it possesses nevertheless advantages over alloyed silver which give it a much finer appearance; it does not get black, nor does it form verdigris, and what it lacks in brilliancy and appearance, is well compensated for in its agreeable lightness Otto says very truly: "If spoons of aluminum were even more beautiful and durable than silver spoons, they would nevertheless not be used in the households of the wealthy, merely because they are cheaper than silver spoons. It is surely more agreeable to hold a light spoon than a heavy one, but the silver spoons are made as heavy as possible, and tea spoons are made as large as children's spoons to exhibit the wealth of the owner. The larger the spoon, the wealthier the man." We may let time conquer these prejudices, and hope that all-subduing fashion will make itself useful in this field.

The more important question which now deserves our attention is: Whether it be not possible to plate certain metals and alloys, of unsatisfactory color or which are subject to changes in the air, with aluminum, so as to give them, at least superficially, the advantages and properties of this beautiful metal? For this purpose, as so small a quantity is used to cover a large surface, the present high price would not be any drawback; and the question now remains: Is the coating of ordinary metals with aluminum practicable? This question has lately been propounded in the *Deutsche Industrie Zeitung* as follows: "Does any one know of a recent and reliable process for electroplating other metals with aluminum or its alloys?" This question must be answered in the negative. There are, in general, two methods known, which are employed to coat one metal with another, namely, the galvanoplastic process and plating with foil. The separation of aluminum by the galvanic current succeeds only when the anhydrous double salt of chloride of aluminum and sodium is used; this salt melts at 185° C., and thus an incoherent coating only is obtained, which, besides, contains chloride of sodium, and is in no wise durable. From watery solutions, aluminum has not as yet been precipitated in a metallic state, and Gore certainly errs in stating that, with a weak current, copper may be plated with aluminum. In regard to plating with foils of this metal, it is possible in some degree, but the resulting product is perfectly useless. Plating in this manner requires a sort of brazing and a final intimate unification of both metals by rolling, and these conditions cannot be fulfilled with aluminum. As is well known, the ductility of this metal is almost destroyed by only a small admixture of other metals; iron makes it fragile, and copper imparts to it the brittleness of glass. Although it is possible to melt a sheet of aluminum upon another metal, an alloy is formed at the surface, by contact of the two metals, which possesses no ductility whatever, so that rolling crushes it to powder, and so the foil gets loose and separates. And, even if it were possible to plate with aluminum, it remains very questionable whether there would be anything gained. Aluminum in a compact form is very durable and not readily changed, either by oxygen or sulphur; but it is very changeable in a finely divided state. In sheets and powder it is very oxidizable, and when amalgamated, it heats spontaneously in the air and separates into alumina and quicksilver. The layer of aluminum on the plated metal would in any case be very thin, and it is probable that this otherwise unalterable metal would lose its durability by the extreme tenuity.

### The Steam Excavator.

Mr. Isaac Otis, of Houghton, Mich., writing to the *Railroad Gazette*, says that the Steam Excavator, now so commonly used, was the invention of his brother.

His name was William S. Otis, and at the time he was a resident of Philadelphia. The first machine was built for him by Eastwick and Harrison, somewhere about 1837, and they afterwards built several, including two for the Russian Government, which were used in the construction of the Petersburg and Moscow railroad.

Messrs. Eastwick & Harrison afterwards (in connection with Mr. Williams, of Baltimore) went to Russia, where they built all the locomotives and rolling stock of this great Russian railway.

Mr. Otis died in the year 1839: at the time of his death, he was one of the celebrated firm of contractors under the style of Carmichael, Fairbanks & Otis. Many of the foremost railroad contractors now living commenced as foremen for Carmichael, Fairbanks & Otis, among them such men as Sidney Dillon, O. S. Chapman and others.

These excavators have been, and are still, largely used in the construction of railroads and canals, and, in the shape of dredging machines, in digging out our harbors.

At the time of Mr. Otis's death, his firm were engaged in constructing some of the heaviest sections of the Boston and Albany railroad (then the Western railroad), and were using steam excavators; among other points, the sand cut, just east of Springfield, Mass., was taken out by one of these machines.

The cheapest work ever done in the United States, if not in the world, was in the filling up of the great trestle bridge at Girard, Pa., on the line of the Lake Shore railway. This embankment, of a million cubic yards, was made of earth dug by steam excavators. The contractors were Messrs. Dillon, Chapman & Clyde, and the work was done at a cost of not more than six cents per cubic yard, including digging, hauling and dumping, the contractors furnishing everything except the ties and railroad iron for the track.

The excavators are now built by Messrs. John Southern & Co., of Boston, cost about $8,000, weigh some 22 tuns, last indefinitely (some machines are still at work that were built thirty years ago), and will dig and put into cars 1,000 cubic yards of sand or gravel per day; in fact, about the only limit to their powers in soft digging is the ability to take the material away as fast as the machine can load it. They will dig the hardest earth, and in fact some kinds of rock. The shovel holds 1¼ cubic yards, and in sand they can fill this and dump the material into cars twice in one minute.

Three men are employed in running the machine, an engineer, cranesman and fireman; it consumes about one cord of wood per day, or its equivalent of bituminous coal.

They are locomotives as well as excavators, and can be fitted with extra wheels to run upon a 4 feet 8½ inch gage. They are used in working sectional tracks of 4 feet lengths, and after digging all the earth within reach move themselves up ready for a fresh bite; they make a through cut wide enough for a single track railroad without widening out.

Many railroads have them in use to load their gravel trains.

### Cut Flowers.

Those of our readers, says the *Gardener's Monthly*, who live in what in a social sense we may call the country, have little idea of the growing immensity of the cut flower trade in the large cities. While it is believed that gardening as a fine art, or even the mere cultivation of flowers as a luxury, has not kept up in ratio with the increase of population, the mere florists' trade, that is, that which furnishes plants and flowers for temporary ornament and decoration, has probably doubled within the last ten years. Not only do florists grow flowers of their own in great quantities for baskets and bouquets, but many away from the immediate circle of the cities find it profitable to grow flowers to sell again to those who put them up; and even private gardens frequently contribute to supply the demand. Indeed the tendency of this division between the one who grows the flowers and the one who sells is continually growing greater. Land in the city is high and taxes heavy. Flowers are light and travel easily by rail or wagon, and thus can be raised to better advantage away from the expenses of a large town. The principal flowers grown for this purpose are roses and camellias, but heliotropes, violets and many other popular flowers come into good use. These leading flowers are sold at a price per hundred flowers —camellias in their best time wholesaling at about $20 00 per hundred, and roses at about half this rate. As a general thing, camellias are raised in pots or tubs, but roses are most generally grown in the natural ground under a glass house erected for the purpose. A rose house on this principle is a very pretty sight in the winter season—not quite as gay perhaps as its rival the camellia, but with a fragrance which, if plants have sensation as some wise folk tell us, the camellia doubtless envies. Many roses do not flower freely under glass in winter unless the houses are very tight, or unless they have some age. For most general purposes, Saffrano, Bon Silene, Luxembourg, Isabella Sprunt, Archduke Charles, and Hermosa are popular, flowering young and freely when there is room, good light, and a year or two of age. Lamarque and Marshal Niel are great rose house favorites.

### THE HEALTH OF THE WORKMEN OF THE EAST RIVER BRIDGE.

Mr. F. Collingwood, in a paper read before the American Institute of Civil Engineers, alludes to the adverse criticisms of the press on subterranean foundations, on account of the danger, to the health of the workmen laboring within them, by the pneumatic pressure, and cites, as a case in point, that of the caissons of the East River bridge. On the Brooklyn side, the men worked 8 hours, in two shifts of 4 hours each, down to the full depth of 44·5 feet without injury. On the New York side, the time was reduced correspondingly from 7½ hours at 45 feet to 4 hours at 77 feet. The first fatal case which was considered as fairly attributable to compressed air took place at a depth of 75 feet, from congestion of the lungs. The man was of full habit, and an examination of but two days before had proved his lungs to be sound. There were perhaps a dozen cases of paralysis, which all recovered in from three days to three weeks. At from 50 feet depth to the end, severe pains in the legs and arms were frequent, but did not last long. The remedies employed were ergot and morphine to alleviate pains in the limbs; stimulants, together with Jamaica ginger, were given for epigastric pains. Where vomiting set in and was persistent, paralysis frequently followed. Coffee was always served to the men immediately after coming out of the caisson, and bunks were provided in which all who wished could rest.

An important conclusion from the records kept of cases is that the greater number of those who have retained their health throughout are wiry, somewhat spare men; while most of the sick and all who died were fleshy men of full or large size.

The following are the rules for the workmen in the caisson: 1. Never enter the caisson with an empty stomach. 2. Use, as far as possible, a meat diet, and take warm coffee freely. 3. Always put on extra clothing on coming out, and avoid exposure to cold. 4. Exercise as little as may be during the first hour after coming out, and lie down if possible. 5. Use intoxicating liquors sparingly; better, none at all. It is dangerous to enter the caisson after drinking intoxicating liquors. 6. Take at least eight hours' sleep every night. 7. See that the bowels are open every day. 8. Never enter the caisson if at all sick. 9. Report at once to the office all cases of illness, even if they occur after returning home.

### Steam on the Canals.

The Fountain City, a new boat, is the name of a new canal competitor for the $100,000 prize, which arrived at Albany recently, after a five days' trip from Buffalo. The propelling wheels are described as so arranged that the waves produced by one wheel are broken down by those from the other. Her speed averaged over three miles per hour. The wheel is said to have all the power of a screw in the fore and aft blades, and a square pull, in addition, by one of the side blades, and consequently will develope more power, it is supposed, with fewer revolutions per minute, than ordinary wheels.

### Wooden Ware Works.

The Erie Wooden Ware Company's works, at Erie, Pa., occupy a main building 250×125 feet. They have one engine of 70 horse power; two pail lathes, one tub lathe, one automatic saw for broom handles, one broom handle lathe, two top and bottom lathes, three stave saws, one matcher for edging up, one planer, and three saws for slitting staves the right lengths. The workshops, says the *American Manufacturer*, are quite interesting and present a very pleasing picture. First the rough logs are cut up into required shape and length, and then, by a peculiar machine, the staves for the tub are cut from it in a slightly curved form, which entirely does away with the old system of bending them; and from one man to another the staves are handled until the rough pail is made or fixed together; then one man turns the outside with chisel and sand paper until perfectly smooth, and another does the same for the inside; then it sent to another department for the bottom and lid, and then for the hoops. Everything is in place, all are unusually intelligent men, and order reigns supreme. The whole implement reminds us of some magic apparatus. After being made in the shop, the pails are sent to a floor above where the handles are put on, and those intended for dairy purposes are taken to the painter's room, and after receiving his attentions are packed in another department for shipment. We were particularly interested in seeing the drying houses, situated some distance from the main building, of which there are ten, six of which are for steaming purposes, and four are operated upon by hot air, for which purpose the company have four separate boilers. There are constantly 50,000 feet of lumber, about 500 cords of pail bolts, and from 400 to 600 cords of cut staves being operated upon. The specialty of this company is in the manufacture of tobacco tubs, and they are certainly made with great skill and high-finished material. The company own 4½ acres of land here and intend to double the capacity of the present factory as soon as possible. They have sixty-five men and boys constantly employed, and have orders ahead; and, at present, their income exceeds $250,000 per annum. The officers are S. S. Spencer, president; G. W. F. Sherwin is general superintendent, and R. W. Flower, Jr., secretary and treasurer.

THE Academy of Sciences of Bologna, Italy, offers a prize of 1,200 francs ($240) for the best essay on the applications of galvanism. The papers may be written in Latin, Italian, or French, and must be submitted before June 30, 1874.