Action of the Electric Arc on the Diamond.

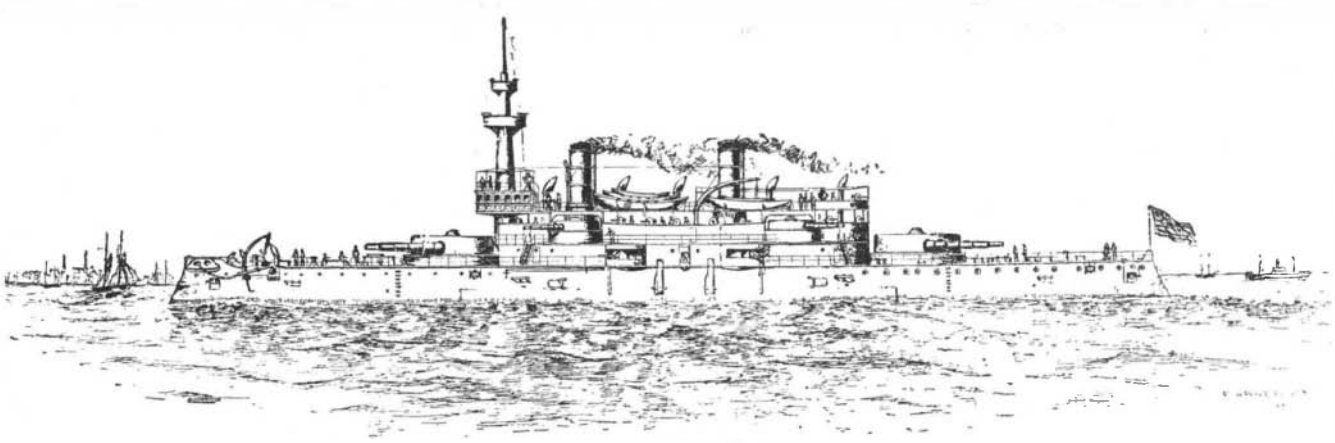
M. H. Moissan, in the *Compt. Rend.*, deals with the action of the electric arc on the diamond, amorphous boron, and crystallized silicon. In the electric arc, at a somewhat high temperature, the diamond becomes incandescent, swells up without melting, and becomes covered with black masses consisting entirely of hexagonal lamellæ of graphite, which is easily converted into graphitic oxide. If the diamond is placed in a small carbon crucible in the electric furnace previously described, and is subjected to the action of an arc produced by a current of 70 volts and 400 amperes, the crystal first breaks up into small fragments along the planes of cleavage, and then at higher temperature swells up and is completely converted into graphite, which yields yellow graphitic oxide. It follows that at the temperature of even a moderately intense electric arc, the stable form of carbon is graphite. When heated in a carbon envelope at the temperature of the oxy-hydrogen blowpipe, the diamond is covered with an adherent black mass, which slowly dissolves in a mixture of potassium chlorate and nitric acid, but which is not graphite. Amorphous boron, prepared by means of magnesium, volatilizes without fusion in the electric arc, the extremities of the electrodes being converted into partially crystallized boron carbide. Crystallized silicon, when heated in the arc, first melts and then boils, the extremities of the electrodes at the end of the experiment being covered with pale green crystals of carbon silicide. The phenomena in the arc were observed by projecting on a screen by means of an intense arc an image of the arc of lower intensity in which the substances were heated.

THE NEW BATTLE SHIP INDIANA.

The latest and the most formidable thus far of our new warships had her preliminary trial on March 7. The course was off Cape May, where she was practically under five hours' continuous steaming at high speed, everything working smoothly. The first runs were made with natural draught, and the speed averages were 14·02 and 14·12 knots; then a moderate forced draught was used, bringing the speed to 15 knots, which is that called for by the government contract. Two trials were then made with the full forced draught, bringing the speed to 15·6 knots, a result considered highly satisfactory by the builders. From the results obtained on this trial it is predicted that the ship will make sixteen knots or more on her official trial. A premium of $25,000 is paid by the government for every quarter knot attained over fifteen knots.

The Indiana was built by the Messrs. Cramp, of Philadelphia, and the contract price was $3,020,000, exclusive of armament. She was launched February 25, 1893. She is designed to meet in battle the best modern war ships, carrying the heaviest guns and armor. She is built entirely of steel, with a length between perpendiculars of 348 feet; extreme breadth, 69¼ feet; mean draught, 24 feet; displacement, 10,281 tons. Her hull has numerous watertight compartments, and the armor protection consists of a heavy belt of Harveyized nickel-steel armor, 18 inches thick, extending along the water line. Rising from each end of this will be an armored redoubt, 17 inches thick, extending to a height of 3½ feet above the main deck. Within the redoubts will be two 18 inch turrets (one in each), containing the heaviest guns. There will also be other armor elsewhere on the ship of less thickness.

The powerful armament, however, is the feature of the ship, it being the most efficient afloat. It will consist of four 13 inch breech-loading rifles, mounted in pairs in the two turrets referred to; eight 8 inch breech-loading rifles, in four turrets, placed at each corner of the superstructure; four 6 inch breech-loading rifles and a secondary battery of sixteen 6 pounder and four 1 pounder rapid fire guns and four Gatlings. There will be also six torpedo tubes. The vessel is cut up forward beneath the water line, making a powerful ram bow, doing away with excessive bow waves on account of easier lines so obtained, as well as greatly adding to her maneuvering qualities.



THE NEW BATTLE SHIP INDIANA.

Saccharin.

Saccharin is regarded by a French writer (*London Lancet*) as a valuable antiseptic. A strength of 1 to 500, as an addition to mucilaginous and other solutions, prevents the formation of low organisms. Thus a valuable, inexpensive dentifrice may be prepared by simply dissolving saccharin in water, to the proportion of 6 per cent. A teaspoonful of this in a half pint of water forms an admirable antiseptic mouth wash. In cases of malignant or other diseases of the stomach, requiring the washing out of that organ, a solution of saccharin of the strength of 2 per cent will be found very suitable.

EMIL GREINER'S AUTOMATIC PIPETTE.

The ordinary chemist's pipette is a troublesome apparatus to manipulate. It is filled by absorption with the mouth, and its contents, of course a fixed quantity in all cases, are determined by the liquid standing exactly at the level of the marks surrounding its upper stem. In filling a small surplus is invariably drawn into it and by closing the top with the finger it will be kept full. By admitting air at the top, the liquid is suffered to descend until the mark on the upper stem is reached, when it is ready for delivery. It is quite difficult to reach the upper mark exactly. As ordinarily used by mouth absorption, there is always more or less danger of the liquid being drawn into the mouth, which in the case of sulphuric acid, or ammonia and similar chemicals, is a source of absolute danger.

The cut illustrates an automatic pipette, due to Emil Greiner, of this city, which, in its construction, does away, not only with all danger in its use, but which makes the measuring of the liquid instantly effected by the filling operation. The upper stem of an ordinary pipette terminates in a contracted nozzle somewhat bent over; from this upper nozzle to the lower one it holds the exact quantity for which it is marked. A second glass bulb fastened airtight to the upper stem of the pipette is fitted with an India rubber bulb at its upper extremity. To use it the bulb is squeezed, the lower end of the pipette is placed in the liquid and the bulb released from pressure. As it expands the liquid rises in the pipette until it overflows from the upper end. When the bulb has fully expanded the overflow ceases, and on removal from the liquid the pipette is accurately filled. Its contents can then be delivered as desired by squeezing the rubber bulb. A certain amount of overflow collects in the upper glass bulb, which is removed by pulling off the upper bulb and emptying it from the upper end. For chemists, especially in operations of the silver volumetric assay, in the mixing of standard solutions, its applicability is obvious. For the photographer it is admirably adapted, supplying him with an accutate measure of volume, instead of the grossly inaccurate graduate so generally used.

Aluminum Bronze.

At the recent meeting of the American Society of Mechanical Engineers, Dr. Leonard Waldo presented to the members some specimens of what is called "aluminum bronze," by which is meant an alloy composed of nearly 10 parts of aluminum to nearly 90 parts copper. This, it was stated, was an alloy which could not be separated into its constituent metals again by any ordinary process, had 90,000 pounds tensile strength, with 15 per cent elongation, would cast, forge, roll hot and cold, draw into wire, work in the lathe about as well as steel did, took a high polish, and did not readily tarnish. He pointed out that the difficulties in making most large castings had been substantially overcome, and that the bronze was particularly available for castings to replace complicated steel forgings for steel tooled work where the labor was large. The bronze was stronger than the steel. "It was a mistake," the speaker said, "to classify the alloy of aluminum and copper among the bronzes. Such evidences as we possessed seem to show that a chemical reaction took place when aluminum was added to copper, and that the new compound was soluble in molten copper. There were reasons for thinking that the maximum effect of strength and ductility combined was obtained with an alloy of 10 per cent, and in order to distinguish this alloy from the other alloys containing a less amount of aluminum, it was proposed to call aluminum bronze having 5 per cent of aluminum, or one-half the amount of the standard bronze alloy, half aluminum bronze, and so also a bronze containing one-quarter of the amount of the standard, one-quarter aluminum bronze."

These grades have very markedly different qualities, the grades containing but little aluminum possessing the higher ducility and less rigidity. They all possess a greater resistance to corrosive influence than any other commercial copper alloys.

Spoons were shown made of an alloy containing about 5 per cent of aluminum, and called "half aluminum bronze," these appearing much like solid gold, and, in fact, being passed as such in some instances by jewelers. He expressed the belief that this bronze would prove to be exceedingly valuable in machine construction, especially in view of the possible cheapness of the metals of which it is composed, it having been shown, for instance, that copper could be laid down in New York at a cost of 6¾ cents per pound and that aluminum could be made at a cost of 28 cents per pound.

The Manufacture of Slag Bricks.

The manufacture of bricks from blast furnace slag has attained considerable dimensions in Germany, the Luhrmann furnaces, near Osnabruck, alone having turned out 5,100,000 bricks. The manufacture has also been taken up by other iron works. The granulation of the slag, the first essential portion of the process, which is substantially the same everywhere, is effected by running the slag along a channel together with a stream of water into a reservoir, in which it is collected. The lime to be mixed with it, in the proportion of one part to six of granulated slag, is slaked with sufficient water to yield a moist sludge, and the two ingredients are thoroughly incorporated in a mill, which process is conducted in the following way: The mixed slag and lime are conveyed by a spout, to which a shaking movement is communicated, to a pair of rolls, which stop the access of unduly large fragments of slag or foreign bodies to the mixer proper, and mingle the slag and lime still more thoroughly while reducing them somewhat in size. The final mixing is effected by a set of three drums with radial projections fitting into each other with only a slight amount of clearance, so that the ingredients are brought into the most intimate contact. A machine absorbing two to three horse power will serve to prepare the material for 9,000 to 10,000 bricks per shift of 10 hours. The mixture is moulded into bricks by a machine, which is provided with a hopper kept filled by the laborer in charge, and an arrangement whereby the quantity necessary to form one brick is let down into the mould and then the aperture closed, while the movable sides of the mould are brought into position by eccentrics, and by this means pressure is exerted upon the mass to shape and consolidate it. The finished brick is pushed out of the machine and the operations of filling the mould and applying pressure are repeated. A machine absorbing seven to eight horse power will turn out at least 9,000 to 10,000 bricks per shift, its capacity being limited chiefly by the time consumed in removing the finished bricks. The bricks thus prepared are weak at first, and have to be handed carefully, and must be stacked and protected from rain for the first day, a precaution that is not afterward necessary. They become sufficiently strong for use for building purposes after the lapse of six to twelve months.

Australian Eggs.

Eggs are now shipped from Australia to England. A trial shipment, made by the Hon. J. H. Conner, of Victorian eggs and cheese, was lately inspected by an officer from the department of the Agent-General for Victoria. With regard to the packing of the eggs, they had, in the first place, been rubbed over with grease and afterward placed with bran, flour, lime, and pollard in small cases. When opened they were found to be perfectly fresh and sweet. The cheeses, which consisted of both 40 pounds and "small loaf" sizes, were sound and of good flavor.

THE largest monolith ever cut in this country was quarried of granite in Missouri and transported to the East on a specially prepared train.