

metal and even certain alloys such as brass in various proportions of copper and zinc can be applied to metal objects. So far the new powders are not on the market in this country, but in England they are sold in small cans for a shilling each and one can is sufficient to plate the nicked portions of a bicycle or to plate a quantity of household silverware.

The powders are composed (1) of the metal to be deposited, in its elementary state; (2) of a salt, preferably a salt of ammonia, and (3) of a powdered metal which must be electro-positive to the metal which is to be deposited. Magnesium is the most electro-positive metal which it is commercially practical to use, and in many of the preparations this forms the active metal element. In some of the preparations, aluminium and zinc are used. The following formula gives the zinc plating powder:

Zinc .....	15 parts by weight
Ammonium sulphate .....	5 parts by weight
Magnesium .....	1 part by weight
Chalk .....	10 parts by weight
Soapstone .....	2.5 parts by weight

Ordinary commercial zinc dust, even though it is not perfectly pure, may be used. This same formula may be used for several other metals. If silver be substituted for the zinc in this formula, a very heavy deposit will be obtained, which will have the white frosted appearance of silver electro-plating before burnishing. If gold is substituted for the zinc, the deposit will be a light yellow, but various shades down to a rich red have been obtained by varying the formula. The article which is to be plated with the powder does not have to be cleaned before the powder is applied, for the powder itself acts as a cleaning powder and liberates the oxygen of an oxidized surface. The amateur who wishes to experiment with these powders should bear in mind that they have been patented abroad and that patents are pending in this country.

#### MAKING MILK ARTIFICIALLY.

BY A. J. JARMAN.

We have heard so much about the synthetic production of perfumes, syrups, dyes, and what not, from coal-tar products, that we are not easily surprised by the information that milk may be artificially made. The method described below, however, is not a chemical one, but consists merely in the mechanical admixture of distilled water with crushed and finely ground sweet almonds. Practically the only difference between cow's milk and that made of almonds is that cow's milk contains animal casein, while the artificial milk contains vegetable casein. The latter will produce a good supply of cream, and if allowed to stand some time will become sour. It may also be coagulated by the addition of vinegar or acetic acid. When combined with grape sugar, it is capable of generating some extraordinary organic substances. The artificial milk may be used with tea and coffee in the same way that cow's milk is used.

To make the milk, procure half a pound of sweet almonds—the Valencia, which is cheaper than the Jordan almond, will give just as good results. The skin of the almonds may be removed by scalding the nuts in boiling water, and peeling them with a sharp knife. The almonds should then be placed in a wooden chopping bowl and chopped as finely as possible. Take about two ounces of the chopped almonds, and place them in a mortar with a small quantity of distilled

may be squeezed through the cloth by wringing it gently, as shown in one of the illustrations, but care should be taken to prevent any of the larger almond particles from being forced through the meshes of the cloth.

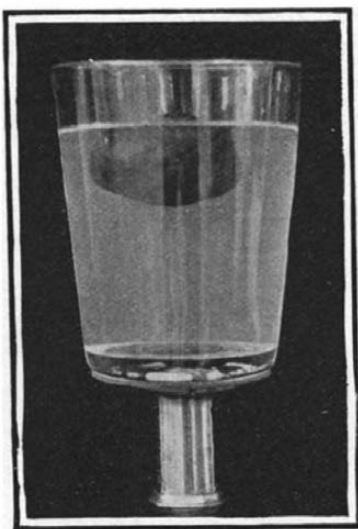
If some of the milk thus produced is set aside for three or four hours, a thick layer of cream will be found on the surface. If too much water has been used in forming the milk, it may be necessary to add a little sugar of milk to sweeten it. The artificial milk has a slight almond flavor when taken clear, but this is practically lost when it is used with tea, coffee, or cocoa. The color of the cream produced is quite pale, but it may be improved by using some of the almonds without the skins removed in the proportion of two ounces of whole almonds to six ounces of the blanched almonds. Care must be taken to prevent any bitter almonds from finding their way into the mixture, but one or two bitter almonds to half a pound would not affect the flavor of the milk.

Half a pound of almonds will make three pints of milk.

#### SOME EXTRAORDINARY DENSITIES.

BY PROF. GUSTAVE MICHAUD, COSTA RICA STATE COLLEGE.

Pick up any common heavy stone, such as granite or compact limestone. Lay it at the bottom of a vessel filled with a fluid, transparent liquid. Common sense tells you that the stone will stay there. Modern



A COMMON HEAVY STONE FLOATING IN A GLASSFUL OF BROMOFORM.

chemistry tells us that, if the liquid has been selected for such a purpose, the stone will spring up to the surface as if it had been forced into mercury instead of being immersed in what seems to be water.

Liquids which are denser than glass, marble, or common stones are not numerous. Leaving aside the metals mercury and gallium, and the metalloids bromine, which is opaque, caustic, and emits suffocating vapors, the most interesting of such liquids are the aqueous solutions of the tungstoborates. Their densities reach 3.3 (saturated solution of cadmium tungstoborate). An idea of the meaning of such a number can be gathered from the fact that a man, with his shoes weighted so as to lower his center of gravity, could stand erect in such a solution with more than half of his body out of it. The chemist Klein, who studied the tungstoborates, proposed to use them for

of the rarer metals being lighter than water. The cheapest of them (80 cents a pound) is sodium. The experiment should not be made with a piece larger than a corn seed, for it is sometimes attended with unexpected explosions and projections of caustic soda. As a rule, however, the metal runs swiftly and quietly over the water while decomposing it.

Sodium is the cheapest of the extremely light metals, but it is not the lightest. Lithium, a beautiful metal of a silvery white color, is lighter than dry pine wood. Yet, from the chemical standpoint, it is more metallic in its properties than the heavy osmium, which occupies the other extreme position in the list of solid elements arranged according to their increasing densities.

Such extreme differences in density are not found among liquids, yet organic chemistry gives us two colorless, transparent liquids which so differ that a vessel filled with the lighter of them, amyl hydride or pentane, and easily carried by one man, could not be lifted by four men when filled with bromoform. The density of pentane is 0.6, that of bromoform, 2.9. Both liquids are apparently more fluid than water, and it is always amusing to watch the countenance of the unaware person who is requested to remove a glass full of bromoform from one place to another. Bromoform is sometimes prescribed by physicians against whooping cough. It is found at every drug store and costs but \$1.75 a pound.

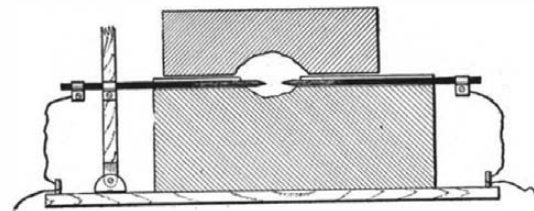
But it is with gases that the greatest divergences in density occur. Iodoform vapor, which causes the intense stench of that well-known antiseptic, is 197 times heavier than hydrogen. When some iodoform is vaporized in a porcelain dish placed over an alcohol or gas lamp, it is partially decomposed. Iodine vapor is set free, and remains mixed with iodoform vapor. As iodine vapor is itself one of the heaviest of gases, the experiment remains very beautiful. If the air is quiet, a lateral jerk given to the dish causes the layer of violet gas to oscillate heavily, just as a liquid would do in similar circumstances.

#### A SMALL ELECTRIC FURNACE.

BY A. E. PARKINS.

The accompanying cut shows the cross section of a small electric furnace made from a description of the Moissan furnace. In this one the brick and lime cavity are replaced by a block of limestone about 5 x 5 x 9 inches. In the top face of the base is hewn a cavity about 1 x 1 x 2 inches, also two longitudinal grooves to receive the carbon electrodes.

The cover is a similar stone with a cavity hewn in its lower face. Both base and cover should be bound with a piece of sheet iron or tin to keep the pieces in place should the heat be great enough to crack the stones. The carbons are regulated by means of the vertical lever, hinged at the base and attached to the carbon by means of a clamp. This clamp is attached to the lever at one place only. This allows



A SMALL ELECTRIC FURNACE.

sufficient horizontal movement. The electrodes are connected to a lantern circuit (alternating current 212 volts) by means of clamps. These clamps and other metal work are made from sheet aluminium—easy to cut and easy to shape. The bolts used are short stove bolts.

In such a contrivance calcium carbide, calcium phosphate, phosphorus, brass, and alloys are easily prepared.

Calcium carbide requires intense heat; the cavity should be small. Gas carbon or powdered arc light carbon is best to use.

Calcium phosphide is prepared by heating calcium oxide, carbon, and red phosphorus. The phosphorus is placed in first, in small quantities; this is covered by the other ingredients, well mixed and pulverized. Some kinds of animal charcoal and calcium oxide will produce calcium phosphide.

Phosphorus is prepared as directed in Newell by heating a phosphate, charcoal, and sand. Phosphorus is separated and burns at the top. It sometimes sublimates on the faces of the stones and bursts into flame when the cover is lifted. The glass-like slag remains in the furnace. This is exceedingly hot. Pieces of porcelain are easily melted when pushed into this plastic mass.

Brass is easily made by heating zinc and copper. The stones may be obtained from the refuse heap at a stone cutter's. The corner of an old ax will prove a good instrument for cutting the grooves and cavities.—School Science and Mathematics.



Chopping the almonds.



Grinding the almonds in water.



Filtering the almond milk.

#### MAKING MILK ARTIFICIALLY.

water. Then grind or levigate the chopped almonds, adding water occasionally, until about twelve ounces of water have been used. The longer the grinding is continued, the thicker and richer will the milk be. Now take a piece of cheese cloth about 12 inches wide by 24 inches long and rinse it in clean water, and after wringing it as dry as possible, fold it double over the top of a pitcher, and pour the contents of the mortar through the cloth into the pitcher. The milk

the sorting of ores and other minerals, as, in most cases, useful or precious stones only will go to the bottom of their solutions. Their price however (the saturated solution of cadmium tungstoborate is sold at two cents a gramme) will for some time to come preclude such an application.

Solid aluminium remains on the surface of such liquids. To see a metal floating over a watery fluid is however no new spectacle for the chemist, several