ties, and this is a prominent trait of iodine. To the American physician, indeed to the inhabitants of all countries cursed by malarial fevers, this is a subject of unusual importance. It would be a national blessing to have an effective, safe, and cheap substitute for quinine; for, although the government has recently removed its protection from the latter, this action will affect not so much the pocket of the patient as that of the apothecary.

THREE RULES FOR ABBREVIATING MULTIPLICATION.*

(From the "Talkhys Amali al Hissab.")

The "Talkhys Amali al Hissab" ("Analytical Résumé of Calculating Processes"), written by Ibm al Banna, of Morocco, contains, in the chapter devoted to the multiplication of integral numbers, some abbreviated methods by means of which, in certain particular cases, the product of the multiplication of two integral numbers may be obtained very quickly. As these processes deserve to be known, and are not found in any arithmetical treatise (although the "Talkhys" gave them nearly six centuries ago), we publish them for the benefit of our readers.

FIRST RULE.—Suppose it be required to multiply by itself a number composed of figures, each equal to unity; for example, 11,111 × 11,111.

We say that the product will be, 123,454,321.

To obtain this we write the number of figures contained in one of the factors, and to the left and right of this number we place symmetrically the natural decreasing series of numbers less than it. Thus, in the example proposed we write down 5, that being the number of figures in one of the factors, and then we place on each side of that number the natural decreasing series of figures less than 5, that is, 4, 3, 2, 1, in the following form, 1234 5 4321.

Another Example.—Multiply 1,111,111 by 1,111,111. The product will be at once obtained by writing to the left and right of 7 (the number of figures contained in either of the two factors) the numbers 6, 5, 4, 3, 2, 1, as follows: 1,234,567,654,321. If we multiply 11 by 11, the application of the same rule will give as result, 121.

SECOND RULE.—To multiply by itself a number composed of figures, each equal to 9; for example, 99,999 by 99,999. We say that the product will be, 9,999,800,001.

To obtain this result, we write down the figure 8, placing to its left as many *nines*, and to its right as many ciphers, as there are figures less one, contained in either of the two factors, afterwards adding to the extreme right of the resulting number the figure 1. Thus, then, in the proposed example (99,999 × 99,999) we write the figure 8, and to its left the figure 9 repeated four times (5—1), and to its right four zeros (5—1), giving as a result 9999 8 0000; now annexing the figure 1, we obtain the product sought, 9,999,800,001.

Another Example.—If we desired to find the product of 9 by 9, we should obtain, by applying the general rule, 81. In fact, in this case, the number of figures of either factor, diminished by 1, gives zero as a result. This explains why the figure 8 does not appear accompanied by *nines* or cipher, but only by the figure 1 of the units.

THIRD RULE.—To multiply a number composed of figures each equal to 9, by another whose figures, although equal to each other, are different from 9; for example, 999 by 6 6.

In this case we say the product will be equal to 665,334.

To obtain this result, we first obtain the product of a figure of the multiplicand by that of the multiplier; the figure of the units of this preliminary product will be the number of the units of the product sought. To the left of the figure of the tens of the said preliminary product we write the figure of the multiplier as many times as there are figures, less one, in either of the two factors; and to its right we place the same number of figures, each equal to the difference between a figure of the multiplicand (9) and a figure of the multiplier (6). To the extreme left of the quantity thus obtained we annex the figure of the unit of the preliminary product; thus we have the product sought. To make this clearer: in the proposed example, 999 × 666, the preliminary product will be 9 × 6 = 54; so that, to the left of the figure (5) of the tens, we place the figure of the multiplier (6) as many times, less one, as there are figures in either factor, which in this case will be twice (3—1), and to its right twice the figure 3 (the difference between 9 and 6), as follows, 66 5 33; and to complete this number we annex to its right the figure (4) of the units of the preliminary product (54). We then have the product sought, 665,334.

Another Example.—Suppose it be required to multiply 9,999,999 by 3,333,333. The preliminary product is 27, and the number of figures in each of the factors is 7; so that, writing to the left of the figure 2 (of the tens of the preliminary product) six (7—1) figures, each equal to one of those of the multiplier (3), we have, 3333332. Now, if to the right of the same figure (2) we write six figures, each equal to the difference between the figures of the two factors (9—3), we have, 333333 2 666666; and finally, we obtain the definite product by annexing to the right of the foregoing quantity the number 7 (the unit figure of the preliminary product), as follows: 33,333,326,666,667.

Another Example.—If 99 be multiplied by 22, as the preliminary product is 18, and each factor contains two figures, it will be sufficient to write, to the left of the figure of the tens (1), the figure of the multiplier (2) but once, and to its right the figure 7 but once (the latter being the difference between 9 and 2); we will thus have 217, and to this we annex the number 8 (the unit of the preliminary product), and obtain the product sought, viz., 2,178.

This rule will hold good in all cases except those in which the factors contain each but a single figure. If, for example, we should apply the rule to the case 9 × 2, the preliminary product, 18, would at the same time be the final product. It is easy to see that the second rule may be considered as a particular case of the third—one in which the difference between the figure of the multiplicand and that of the multiplier is zero.

* Translated from the *Cronica Scientifica*, of Barcelona.

ENGINEERING INVENTIONS.

An engine valve, so constructed and arranged that the pressure of the steam upon the valve from above will be nearly or quite counterbalanced by the pressure from below has been patented by Lewis H. Baker, of Fairfield, Ill.

Mr. Jean L. Nevers, of Pass Christian, Miss., has patented in this country and in England an improvement in vibrating propellers, in which reciprocating propeller blades are employed, and the improvement consists in a novel device for controlling the propeller blades. In this propeller the change of direction is always under the immediate control of the person who has charge of the steering wheel, and though the motion of the engine may not cease, the positions of the blades can readily be changed at each stroke so that they will exert no force upon the water.

Mr. James H. Gray, of Connellsville, Pa., has patented an improved device for attachment to locomotive, marine, and other engines, to operate them by compressed air. The invention consists in a series of air drums, arranged at some distance apart in the water tank of a steam engine, connected together by pipes, and communicating with suitable pumps operated by the engine, and connected by a pipe along the outside of boiler with the steam chest and cylinders.

Mr. James H. Gray, of Connellsville, Pa., has patented a direct acting pump, in which a steam or water pump and steam cylinder are operated in connection with a single piston. The invention consists in an improved construction of valves, by which a steam chest is dispensed with and the pump is rendered cheap and effective.

A switch bar, having jaws which are adjustable lengthwise of the switch bar so that they may be moved to fit the rail, and the rails and jaws shifted to the desired gauge, has been patented by Mr. William K. Dunwoody, of Eagle Mills, Mich.

Bearing Fruit.

Twenty-five years ago we went to the wedding reception of a charming and brilliant young woman from a New England State, just married to a young physician in a Western city. She had come from the best schools, and was the woman, of all others, who was looked at as a leader in the higher literary and artistic life of a prominent circle in the town. Seven years ago we again met that woman, now a matron of forty-five, in a Western university town, where her husband had finally landed as a professor of sciences in the college. We saw that the family were living in quiet and simple elegance on the small salary of a Western professor, with a house full of fine children, and no servant that we could discover.

At tea we ventured the question, "What has been the result of your studies and experience in the last twenty years? I have seen no book, or magazine article, or poem, over your name, as we expected." "I will show you my one book," she replied, leading the way to her kitchen. There she exhibited a most ingenious machine for washing the dishes of her table, which abolished the drudgery of this disagreeable end of housekeeping, and enabled a child, with the help of two "lifts" from mother, to make a play of what would be the work of a servant.

Now, of course, not every cultivated school girl has the inventive faculty to do what this woman had accomplished. But think what she has done! She has made it possible for every mother in America to save an hour a day for study, or work, in the upper side of life. She has made it not only a respectable, but an artistic employment to wash table dishes. She has made home duties and housekeeping more attractive to all her daughters, and taken one more step toward the abolition of the drudgery that has so crushed out the lives of a thousand generations of women since the days of mother Eve. We doubt if any book, even a new novel by George Eliot, or a new picture, a new voice like the warble of Gerster, or any splendid thing that may be done by a woman in America, would go so deep, touch on higher realms of life, or more justly entitle that cultivated Christian lady to the respect and admiration of the country.—*New England Journal of Education.*

Running Expenses of Narrow Gauge Railroads.

The St. Louis *Republican* gives the following estimate of the running expenses of a narrow gauge railroad, based on the performance of nineteen locomotives during the month of June last:

The locomotives consume one ton of coal per seventy miles, one pint of oil for thirty-eight miles, one pound of tallow for seventy-seven miles of running. Engine repairs have cost 4 3-10 cents; the wages of engineers, firemen, and round-house men have cost 5 9-10 cents; fuel has cost 1¼ cents; and oil, tallow, and waste have cost ¼ of a cent per mile run by the engines, making a total for engine services of 12 cents a mile; a result which is seldom equaled in the direction of economy.

Memoranda for Disinfecton of Yellow Fever.

The following rules have been published by the National Board of Health:

1. It is prudent to assume that the essential cause of yellow fever is what may, for conciseness, be called a "germ," that is, something which is capable of growth and propagation outside the living human body; that this germ flourishes especially in decaying organic matter or filth, and that disinfection must have reference both to the germ and to that in or on which it flourishes.

2. Disinfection, when used in a place not infected, for the purpose of rendering filth, or foul soils, waters, etc., incapable of propagating disease germs, is a poor substitute for cleanliness, and is mainly useful to make the process of cleansing odorless and harmless. The best disinfectants for this purpose are sulphate of iron, carbolic acid, fresh quicklime, fresh charcoal powder, chloride of zinc, chloride of aluminum, and permanganate of potash.

3. The two great difficulties in destroying the vitality of the germ of yellow fever are, first, to bring the disinfecting agent into actual contact with the germ; and, second, to avoid injuring or destroying other things which should be preserved.

4. *When the germ of yellow fever is dry, or partially dried, no gaseous disinfectant can be relied on to destroy it.* It must either be moistened or subjected to a dry heat of not less than 250° F., to obtain security.

5. In disinfecting or destroying infected clothing, bedding, or movable articles, *move them as little as possible while dry.* Before disturbing them have them thoroughly moistened, either with a chemical disinfecting solution or with boiling water, in order to prevent the diffusion of dried germs in the air in the form of dust.

6. The best method of disinfecting rooms, buildings, ships, etc., is still doubtful, owing to the difficulty of destroying the vitality of dried germs.

The Board proposes to have this subject carefully investigated, and in the meantime advises thorough scrubbing and moist cleansing, to be followed by the fumes of burning sulphur, at the rate of 18 ounces per 1,000 cubic feet of space to be disinfected.

The sulphur should be broken in small pieces, burned over vessels containing water or sand, which vessels should be distributed in the closed space to be disinfected at the rate of one to each 100 square feet of area of floor.

7. No patented compound known to the Board is superior, as a disinfectant, to the agents above mentioned, and none is so cheap. Some of these patent disinfectants are good deodorants, but *the removal of an unpleasant odor is no proof that true disinfection has been accomplished.*

8. In districts where yellow fever prevailed last year the following precautionary measures should be taken:

(*a*) Textile fabrics of every description which were exposed to yellow fever infection during the year 1878, and which have remained packed or boxed in a closed space since such exposure, should not be opened or unrolled, but should either be burned or placed in boiling water for half an hour or more, or in suitable heated ovens, or disinfected, according to the nature and value of the individual article or articles.

(*b*) Every house or room in which cases of yellow fever occurred in the year 1878, and since that time have remained unoccupied, should not be opened for occupation until they have been thoroughly cleansed and disinfected, by persons acclimated to yellow fever.

(*c*) Every privy, vault, underground water cistern, dry well, or closed cellar, connected with a house in which yellow fever existed last year, and which may not have been opened since that date, should not be reopened, but if possible should be covered with several feet of earth.

(*d*) Every suspicious case of sickness should be at once isolated, and every possible precaution taken to prevent infection, by providing attendants who have had the disease, and thorough disinfection of all discharges from the sick. If the disease prove to be yellow fever, all articles of clothing and bedding used about the sick should be burned, the house should be vacated, and every room tightly closed and fumigated with burning sulphur.

A New Way to Treat Diphtheria.

Quite a discovery in the treatment of diphtheria has been made here. A young man, whose arm had been amputated, was attacked by diphtheria before healing took place, and instead of the matter incident to that disease being deposited in the throat, the greater portion appeared on the wounded arm, and the diphtheria was very light and easily managed. Dr. Davis, of Mankato, profited by this, and in his next case of diphtheria blistered his patient's chest, and on this blistered part the chief deposits appeared. This was also an easy case of the disease. The theory of Dr. Davis is that diphtheria usually appears in the throat because of the thinness of the lining of the throat. Hence, when the blister breaks the skin upon any other part of the body, the disease appears there.—*Minnesota letter to the Salem (Mass.) Gazette.*

American Institute Exhibition.

This exhibition opens on the 17th day of September, by which date all exhibitors should be in position. The incompleteness of all exhibitions is the cause of general and well deserved complaint, yet we hope our frequent notices may have at least the effect of having this exhibition in good shape on opening day. Any parties intending to exhibit should apply at once, and address all communications to General Superintendent, American Institute, New York city.

The Silver Mines of Arkansas.

A correspondent of the St. Louis *Globe-Democrat*, writing from Little Rock, describes the mining region of Montgomery county and its minerals as follows:

The district embraces townships 1 and 2 south, ranges 23, 24, 25 west, which includes a district of about 216 square miles.

The main water courses are the Wichita proper, and its south and north forks, besides a large number of small streams and rivulets, all more or less suitable for water power. The same tract of land is well timbered with yellow pine, white and black oak, ash, hickory, black walnut, gum, etc., well adapted for building and mining purposes.

The district forms a basin of small rolling hills, which are continuous throughout its entire length, and is surrounded by the Ozark Mountains on the north, the Mazerne Mountains on the south, the eastern spur of the Cassotal and Little Missouri Mountains on the west, and the Crystal Mountains on the east. These mountains are of secondary and primary formation, containing hornblende, granite, slate, and porphyry.

South of the Mazerne range is a younger formation of novaculate and limestone. The summits of the Crystal Mountains show ledges of metamorphic sandstone, underlaid by slate and sub-carboniferous limestone, which leads to the conclusion that this entire mineral belt is underlaid by sub-carboniferous limestone and porphyry.

The basin itself shows calcous shale and slate—the latter being generally exposed in the gulches and river banks—and is traversed by a belt of quartz veins which runs in an eastwardly and westwardly direction, and can be followed westwardly its entire length through the Cassotal range to the Indian Territory, thence through the Wichita Mountains, in the northwest part of Texas, striking the Rocky Mountains in New Mexico, the belt showing the same formation throughout its entire length, which has been conclusively proven by many of our most eminent geologists and mining engineers who have spent years of time and labor in determining this important fact, and who offer as an evidence of the correctness of this view the fact that the same minerals exist in the same character of quartz and spar throughout both entire districts.

The veins opened up to the present time have given evidence of walls and selonge, and are the quartz veins freely impregnated by gouche, which dip north, and have more or less strong overlap south, and have a general strike from 8° to 25° north of east.

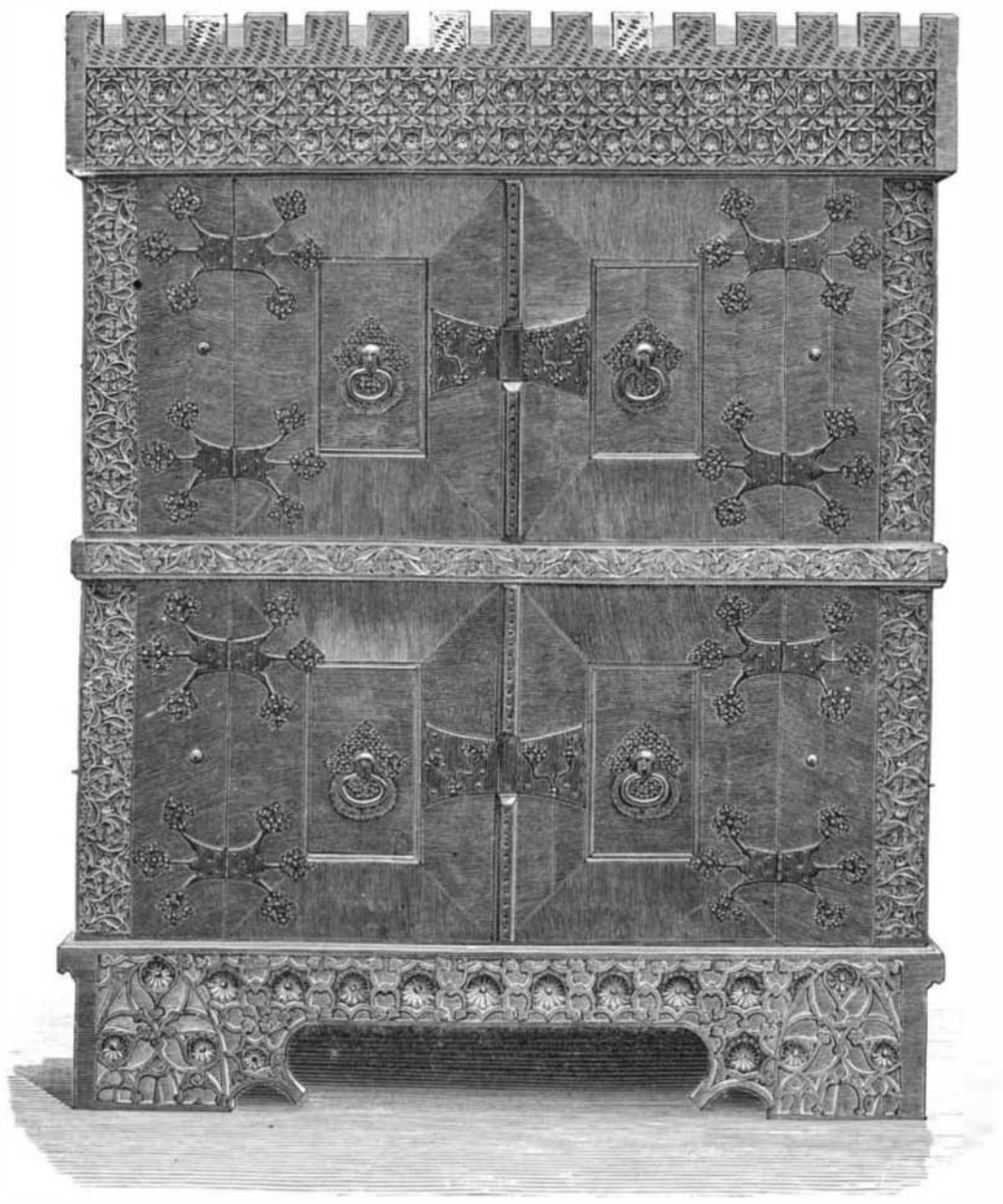
The eminent geologists, Professors Church and Phillips, during their stay in Silver City, made upward of thirty assays, with the most gratifying results, the quartz with two exceptions ranging from 200 to 600 ounces of silver to the ton, and this from specimens picked up indiscriminately from the surface, and in which not the slightest indication of ore was perceptible. These gentlemen were astonished to find such results from quartz that made no showing whatever, and was in no case taken from a greater depth than twenty feet, which was hardly sufficient to enable them to determine with any degree of accuracy the extent or value of the ores of greater depth, but gave it as their opinion that their greatest richness would be at a depth of one hundred and fifty feet.

Prof. Phillips, who was in Mexico in the months of September, October, and November, examined a large number of old silver mines in Chihuahua and Durango, and who has been four months in Arkansas examining its silver resources, states that the two fields, in their general geology, are almost identical in character, and feels convinced that these high grade ores from the quartz veins of Montgomery county will run to wire and other forms of native silver at a depth of 100 to 200 feet, as similar surface ores were found in the same character of quartz incased in slates as were mined by the old Spaniards at Parral, Santa Barbara, and Inde, in the State of Durango, and all of which veins carried more or less native silver at a depth not exceeding 100 feet from the surface.

PAPER is worth six cents a pound in Peru until it is made into money, then it depreciates, adds a wicked editor next door, about fifty per cent.

GOTHIC OAK PRESS.

The carved oak press, with metal work after the style of the close of the 15th century, is an admirable specimen of its class. It is now in the possession of the Art Industry School of Vienna, and is preserved as a good example of fine Gothic carved work.



CARVED OAK PRESS.—AFTER THE STYLE OF THE 15TH CENTURY.

RECENT AGRICULTURAL INVENTIONS.

Mr. William H. Sterns, of Humboldt, Neb., has patented a simply constructed and easily operated churn, in which the agitation of the cream is produced by the rapid movement of the apparatus in a horizontal plane, so that the cream is thrown violently from side to side of the receptacle, a circular or rotary movement being prevented by cream breakers in the sides of the receptacle.

An improvement in corn planters has been patented by Mr. Allen F. Hall, of Onarga, Ill. The object of this invention is to improve the construction of the corn planter for which letters patent No. 197,549 were granted to the same inventor, November 27, 1877, so as to make it simpler in construction, more easily operated, and more readily thrown into and out of gear.

An economical and powerful press for cotton, hay, rags, etc., that may be worked by hand, horse, or steam power, in field, farm, or factory, has been patented by Mr. John Rossell, of Galveston, Texas. The invention consists in combining worm gearing with an eccentric cam for working the movable head of the press, and in a novel arrangement of pins and an endless rope for retracting the movable head.

Mr. Thomas T. Harrison, of Aubrey, Kan., has invented an improved attachment for breaking and cultivating plows, by which the plow can be easily and fully controlled. The invention consists in a novel arrangement of vertical and horizontal bars for supporting and guiding the plow.

The General Wool Monument.

The largest monolith ever transported any distance in this country is the granite shaft to be set up in honor of Major-General John Ellis Wool, at Troy, N. Y. It is of gray granite, measures 3,784 cubic feet, and weighs 254 tons. In the rough it measured 4,763 cubic feet, and weighed 398 tons. The entire monument will stand 73 feet 7 inches high, the shaft alone measuring 58 feet. The stone was cut and finished at the quarry of the Bardwell Granite Company, Fox Island, Maine. This monolith is considerably smaller than the obelisk known as Cleopatra's Needle, lately transported from Egypt to London. The great Lateran obelisk in Rome, originally from the Temple of the Sun, in Egypt, is 150 feet high and weighs 440 tons.

The Swiftest Ship in the World.

A new British war steamer, called the Mercury, built of steel, has just been completed and successfully tried at Portsmouth, England. The vessel is 300 feet long, 46 feet beam, 16 feet 3 inches hold. Displacement, 3,750 tons. On her late trial trip the engines developed 7,595 horse power, and the speed attained was within a trifle of 22 miles an hour. These are remarkable results for a vessel of the dimensions given. The Mercury has twin screws, driven by separate engines arranged in separate engine rooms. Her machinery nearly fills the hull. There are twelve boilers, four high pressure cylinders, each 41 inches diameter, and four low pressure cylinders, 75 inches diameter. Stroke, 3 feet; boiler pressure, 60 to 65 lb.; coal consumption, 2·35 lb. per hour per horse power. One man governs the rudder, which is worked by steam. The vessel's armament will consist of ten 64-pounders.

Two More New Metals.

The discovery of two new metals is announced, named samarium and norwegium. Paradoxical as it may sound to speak of the finding and christening of a hitherto unknown metal before it has been either seen or handled, yet such is the case with samarium. As happened in the instance of the metal gallium, mentioned in the SCIENTIFIC AMERICAN a few numbers back, it has first become known to science by means of the spectrum analysis alone; nor can it be doubted, predicts one of our foreign exchanges, that in the verification of its existence by the senses it will, in due time, follow the same precedent. It is well known that by means of the characteristic rays which are seen in the luminous spectrum, produced by the combustion of any substance, it is possible to single out the known or unknown bodies which enter into the combination. As are the rays, such are the elements producing them. When rays are found answering to no substance already catalogued, the existence of some new body is naturally inferred from the fact. That was how gallium was first brought to light, and now we have a like history for samarium. M. Lecoq de Boisbaudran, who has greatly distinguished himself by his researches in this branch of science, found, as he was examining a mineral known under the name of samarkite, an emission of unfamiliar rays. He has inferred thence the existence in this mineral of a new metal, which he has accordingly named samarium, and all he has now to do is to isolate it from the other elements with which it is as yet combined. This has already been done for another new metal, norwegium, patriotically so named after his fatherland by its discoverer, Professor Teller-Dahll, of the University of Norway, who detected it in a metallic compound of arsenic and nickel. The professor has even determined the principal properties of this new metal, which he describes as being white, slightly malleable, of about the hardness of copper, and fusible at a dull red heat. Its density is represented by 9·44, and its chemical equivalent is 145.

Heating Metals in Vacuo by the Electric Current.

A very interesting paper, by Mr. T. A. Edison, was read before the American Association at Saratoga the other day:

"In the course of my experiments on electric lighting," says the author, "I have developed some striking phenomena arising from the heating of metals by flames and by the electric current, especially wires of platinum and platinum alloyed with iridium. These experiments are still in progress.

"The first fact observed was that platinum lost weight when heated in a flame of hydrogen, that the metal colored the flame green, and that these two results continued until the whole of the platinum in contact with the flame had disappeared.

"A platinum wire, twenty-thousandths of an inch in diameter, was wound in the form of a spiral one eighth of an inch in diameter and half an inch in length. The two ends of the spiral were secured to clamping posts, and the whole apparatus was covered with a glass shade. Upon bringing the spiral to incandescence for twenty minutes that part of the globe in line with the sides of the spiral became slightly darkened; in five hours the de-