

to decorate and adorn their homes and gardens with evergreens, but will extend them along the highways, and make landmarks of them between all neighboring possessions and property.

**Is it a New Element?**

Dr. George A. König, of the University of Pennsylvania, recently announced the discovery of what he thought to be a new metal. If this proves true, America may have the honor of celebrating her centennial year by the discovery of a new element in a peculiarly American mineral. Dr. König states that in analyzing a mineral resembling schorlomite, brought from Magnet Cove, Arkansas, by Professor A. E. Foote, he obtained, in the place of titanic acid, a white oxide which differed from the former very materially. Inasmuch as Dr. König does not tell us wherein these differences consisted, we can scarcely form an opinion on the probability of this being the oxide of some new metal. The oxide of titanium is itself white, when pure, and possesses many remarkable properties, such as existing both in a soluble and insoluble form, of passing from the former to the latter condition simply by continued boiling, of passing gradually into that state by standing, that it is precipitated pure by ammonia in the presence of sulphurous acid, sulphureted hydrogen, or other reducing agents. The numerous forms in which it appears, and its protean changes, would be likely to deceive a less experienced chemist than Dr. König, who has already discovered one new mineral, a hydrated oxide of titanium, to which he gave the name of hydrotitanite.

In M. Mendelejeff's remarkable prediction of the discovery of gallium from a mathematical comparison of the atomic weights of the known elements, he also predicted the discovery of another element to which he gave the name of eka-silicon, or eka-silicium, having its place between silicon and titanium. Perhaps Dr. König has discovered eka-silicium.

The new element, which Mendelejeff called eka-silicium, will be obtained, says he, from its oxide  $EsO_2$ , or the potassic fluoride  $EsK_2F_6$ , by means of metallic sodium. The metal will decompose steam with difficulty, acts feebly on acids, more easily on alkalis. It will be a difficultly fusible metal of a dark gray color, which when ignited is converted into an oxide,  $EsO_2$ , which fuses with difficulty. The specific gravity of the oxide will be 4.7. It will resemble in external appearance, probably also in crystalline form, in properties and reactions, oxide of titanium,  $TiO_2$ . As the acid characters of the oxides of titanium and tin are feeble, although distinct, the new element will possess the same characters and be a stronger acid than titanic oxide. It will bear the same relation to titanium as zinc to calcium, and as arsenic to vanadium; so its basic properties will be more feeble than those of the oxides of titanium and of tin, but stronger than silica,  $SiO_2$ . We may expect it to form a hydrate soluble in acids, the solution being easily decomposed with the separation of an insoluble metahydrate. It will be more easily separated from acid solution than  $TiO_2$ , less easily from alkaline solution. There is no doubt that it will form with corresponding salts of silicon, titanium, zirconium, and tin, isomorphous double fluorides. The potassic fluoride will be more soluble than the corresponding silicon salt. The chloride of the new metal will have the composition  $EsCl_4$ , will boil at  $212^\circ$  Fah., or perhaps lower; its vapor density will be about 1.9 at  $32^\circ$  Fah. It will form, like silicon and tin, a series of volatile metallo-organic compounds, which will distinguish it from the chloride of titanium.

If Dr. König has not really discovered this expected metal, its discovery is not distant, for many of our American chemists are earnestly engaged in hunting it down, and with our vast mineral resources, and the Russian chemist's explicit directions of where and how to look for it, we anticipate speedy success.

Mendelejeff's remarkable prediction of gallium was the result of what he calls the periodic law. His table, from which he obtained his results, and the study of which will probably lead to many other interesting discoveries, having never before been printed in English, is given below:

MENDELEJEFF'S TABLE OF ELEMENTS.

	Group I.	II.	III.	IV.	V.	VI.	VII.	VIII.	Transition to group I.
Typical Series...	H=1								
Series 1	Li 7	Be 9.4	B 11	C 12	N 14	O 16	F 19		
" 2	Na 23	Mg 24	Al 27?	Si 28	P 31	S 32	Cl 35.5		
" 3	(Cu 63)	Zn 65	? 68	Es 72	As 75	Se 78	Br 80	Fe 56, Co 59, Ni 59, Cu 63.	
" 4	Rb 85	Sr 87	(Yt 88)	Zr 90	Nb 94	Mo 96	? 100	Rn 104, Rh 104, Pl 106, Ag 108.	
" 5	(Ag 108)	Cd 112	In 113	Sn 118	Sb 122	Te 125	I 127		
" 6	Cs 133	Ba 137?	(Di 138)	Ce 140					
" 7									
" 8			Er 178	La 180	Ta 182	W 184	? 190	Os 195, Ir 197, Pt 198, Au 199.	
" 9	(Au 199)	Hg 200	Tl 204	Pb 207	Bi 208				
" 10			Th 231			U 240			
Highest oxide	$R_2O$	$RO$	$R_2O_3$	$RO_2$	$R_2O_5$	$RO_3$	$R_2O_7$	$RO_4$	
Highest hydrogen compound			$RH_3?$	$RH_4$	$RH_5$	$RH_6$	$RH$		

**Lead Desilverizing by the Zinc Process.**

Some few years since the system of desilverizing lead with zinc, invented by Mr. Flach and tested at the smelting works of Messrs. Guillem at Marseilles, was fully described in the *Mining Journal*, and an interesting account is now given by Mr. James E. Stoddart of the manner in which the process is carried on by Mr. William Lang, Jr., and Co., at the Clyde Leadworks, Glasgow. He explains that the

treatment of argentiferous lead with zinc, for the purpose of extracting the silver and refining the lead, is by no means a novel process. About 20 years ago a metallurgist named Parkes took out patents for desilverizing rich leads by means of zinc, and a manufacturing firm adopted his process. They were, however, subsequently obliged to abandon it, in consequence of the difficulty experienced in the separation of the zinc from the concentrated silver, to admit of the cupellation of the latter metal. A German chemist, named Flach, afterwards took up the subject, and by running the alloy of zinc, silver, and lead, along with iron slag, through a peculiarly constructed blast furnace, was enabled to free the concentrated silver-lead from zinc. He also proposed the use of this furnace for the removing of traces of zinc from the desilverized lead, but this was abandoned in favor of the ordinary improving or calcining pan. The operation with the blast furnace was found to be very troublesome, and, as the greater portion of the zinc was entirely lost, was by no means economical.

M. Manes, of Messrs. Guillem & Co., Marseilles, who were the first to work Flach's process, found out and patented a simple means of treating the alloy and recovering the zinc by distillation. This is the process now in use, and known as the Flach-Guillem process, and which is carried on at the Clyde Leadworks in the following manner: About 18 tons of rich lead, containing generally from 60 to 70 ozs. of silver per ton, are melted in a large cast iron pot, 1 per cent by weight of zinc is added, and the whole well stirred for 20 minutes. The fires are drawn, and the contents allowed to settle and cool until the zinc rises to the surface, and forms a solid ring or crust, containing the silver and other foreign metals. This alloy is removed to a small pot at hand, where part of the lead is sweated out, and the alloy thoroughly dried. The large pot, with the lead now partially desilverized, is again heated up and treated in the same way as before, but with the addition of only  $\frac{1}{2}$  per cent of zinc, which when it has risen to the top is removed as before and dried. A third addition of  $\frac{1}{2}$  per cent of zinc is found necessary to take out the remainder of the silver, care being taken on the cooling of this zinging that all the crystals are cleanly skimmed off. The lead in the large pot is assayed, and found almost always to contain less than 5 dwts. of silver to the ton of lead; if it should happen to contain more, it is due to carelessness on the part of the workmen. The pot is now tapped, and the lead run down into an improving pan, where it is kept at a high heat for nearly eight hours, for the purpose of oxidizing or burning off the small percentage of zinc which is left in it from the zinging process; after seven or eight hours' firing in this pan, it should contain no trace of zinc. It is then tapped and run into moulds for market lead or for the manufacture of lead products. The old improving pans were made of cast iron, placed on a bed of sand, with a groove in the upper sides, which groove was filled with bone ash, to prevent the action of oxide of lead on the iron. These pans, from the giving way of the bone ash and the great wear and tear on the iron from the high heats necessary, were found to be both troublesome and expensive, being very often under repair, and seldom lasting more than six or eight months. They have been superseded by an improving pan of cast iron, lined with brick inside. This pan, instead of being placed on a bed of sand as was the case with the old improving pan, is hung on brick walls, and is quite open both below and round the outside. This new pan has been working in the patentee's works, Marseilles, for some years, and at the Clyde Leadworks for the last eighteen months, without any breakdown. It burns no more coal, and can be as economically worked in every way as the old pans.

The zinc and silver alloy after being dried is melted in a plumbago crucible, covered on the top, well luted with fire-clay, connected with a cast iron receiver by means of a plumbago pipe, and fired up with coke. The zinc distils over, and is condensed in the iron receiver. After all the zinc has been distilled, the pipe is disconnected, the cover removed, and the lead and silver left in the crucible is ladled out into moulds; thence it is taken to the refinery, where it is cupelled in the usual way. The block of metallic zinc re-

covered in the condenser is removed, and used over again in the first part of the process. All the oxide of lead and dross formed in the different processes are taken to the reducing furnace, mixed with the coal dross, and reduced back to the metallic state. The dross from this furnace still contains some lead, and is put through the slag hearth—a blast furnace fired with coke—the fumes of lead oxide from which are condensed in what is known as Johnson's patent condenser,

and are all recovered. The lead from the slag hearth, which contains a number of impurities, as copper, antimony, iron, or sulphur, is taken to the improving furnace—a furnace built in exactly the same way as the desilverizing pan. About 20 tons of this lead are heated for a period generally from four to five days, but the time varies according to the amount of impurities present. The oxidized impurities as they are formed float to the surface, and are skimmed off by the workman, who is made to keep the lead perfectly clean, so as to have a fresh surface always exposed to the action of the flame. The dross skimmed off is at first of a black color, but gradually becomes lighter as the operation goes on, until it shows nothing but yellow oxide of lead. When this appearance is noted the pan is tapped into moulds or into the desilverizing pot, where it is treated with zinc, and the silver extracted as in the manner before described.

By this process the lead can be desilverized and turned out in the shape of market lead in 30 hours from the time it is put in process, the loss in working being not more than  $\frac{1}{4}$  per cent. That all the silver is thoroughly taken out may be seen from the fact that there is an excess of silver, to the extent of nearly 2 per cent, over the assays obtained on the large scale. An analysis of the market lead gave antimony 0.0015 and silver 0.0004 per cent, a trace of copper, but no iron or zinc, from which it will be seen that the lead refined by the zinc process is almost chemically pure, and to this is due the finer quality of the products manufactured from it.

**An English View of American Manufactures.**

It is incumbent upon the manufacturers of the United Kingdom to show the world at Paris next year that they have not fallen behind the position they once occupied. The competition at Philadelphia was not altogether satisfactory to us.

It is true that every nation has an advantage in exhibitions held within its own area; but the products of the industry of the United States surpassed our own oftener than can be explained by this circumstance. It appeared as if there was a greater economy of labor habitually practised in the States, and in conjunction with this there was evidence of the more constant presence of a presiding mind superintending every process of industry. The best machine in the world will fail to give satisfaction if there is not an intelligent human being at hand to watch it, to take care of it, to detect the smallest failure in its working as soon as it is developed, and to suggest and supply the means of correcting any miscarriage of its functions.

A steam engine dropped from heaven in the middle of Africa might be adored, but could not be put to any use. The failure of many of our industrial enterprises in foreign parts can be traced to the difficulty in procuring agents and assistants that can be taught to use the machines committed to their care.

Much of the mechanical work shown at Philadelphia was executed with a fineness that could not have been exceeded if every man who had any share in its production had originally conceived it and had been solely interested in its success. There was evidence of personal care and personal anxiety; every stage must have been watched with intelligence and with zeal. In comparing the results with our own, we are painfully suspicious that they revealed the application of more brains than we always have at our command.—*London Times*.

**Platinum Plating.**

M. Dodé has patented a plan for giving cast objects a coating of platinum. The object as cast, or after being enamelled, is first washed over with a brush dipped in turpentine; a mixture of borate of lead and oxide of copper is next applied, and the casting dried in a drying stove. The next step is to immerse the object so prepared in a composition of borate of lead, German litharge, platinum in the state of chloride, ordinary ether, essence of lavender, and anilic (?) acid. Finally, the platinized object is submitted to the action of heat.

**DECISIONS OF THE COURTS.**

**Supreme Court of the United States.**

PATENT DRILLING APPARATUS.—WILLIAM H. CAMMEYER AND SAMUEL LEWIS, APPELLANTS, vs. JOHN NEWTON, WASHINGTON BETTS, CHARLES ECCLESTON, AND WILLIAM L. QUINN.

[Appeal from the Circuit Court of the United States for the Southern District of New York.—Decided October Term, 1876.]

Mr. Justice Clifford delivered the opinion of the Court, which was to the effect that the device used by defendants was not covered by the patent of plaintiff. The Court affirmed the following points:  
 Inventions may be assigned before they are patented.  
 Public employment is no defence to the employee for having converted the private property of another to the public use without his consent, and without just compensation.  
 Private property, the Constitution provides, shall not be taken for public use without just compensation, and it is clear that that provision is as applicable to the Government as to individuals, except in cases of extreme necessity in time of war, and of imminent and impending public danger.  
 A patent is private property, and the Government cannot, after it is issued, make use of the improvement any more than a private individual without license of the inventor, or making him compensation.

**Important Patent Decision in Canada.**

In 1873 the Canadian Patent Office granted three patents to George T. Smith, one for a process of milling, and two for flour dressing machines. The following is an extract from the Patent Act of 1872, as amended in 1875:

SECTION 28.—Every patent granted under this act shall be subject and expressed to be subject to the condition that such patent and all the rights and privileges thereby granted shall cease and determine, and the patent shall be null and void at the end of two years from the date thereof, unless the patentee, or his assignee or assignees, shall, within that period, have commenced, and shall, after such commencement, continuously carry on in Canada the construction or manufacture of the invention or discovery patented, in such manner that any person desiring to use it may obtain it, or cause it to be made for him at a reasonable price, at some manufactory or establishment for making or constructing it in Canada; and that such patent shall be void if, after the expiration of twelve months from the granting thereof, the patentee, or his assignee or assignees, for the whole or part of

