THE CITY OF FLORENCE, ITALY.

No city in Italy is more attractive to the tourist than Florence. Rivaling Rome in its art galleries and libraries, it has the renown belonging to the commercial metropolis of the middle ages; and the spirit of independence of its citizens long kept the city free from princely and ecclesiastical tyranny, and made it the seat of culture, learning, and refinement for the whole peninsula.

We publish herewith views of two of the most celebrated buildings in Florence. The first is the Palazzo Vecchio, erected in the year 1298 for the use of the Gonfaloniere and Magistrates of the Republic of Florence. For many ages, it formed the center of the political life of the Florentines. A magnificent staircase leads from the court to the vast hall where Savonarola convened the citizens in his futile attempts to restore to them their ancient liberties. This hall, now somewhat dilapidated, was used for the meeting of the Italian deputies before the removal of the seat of government to Rome. The Palazzo Vecchio contains a large collection of pictures, among which are numerous portraits of great historical interest; and in front of the building, in the open air, are several of the finest statues that the Renaissance period produced. Among them are the David of Michael Angelo (considered by many to be his masterpiece), the Rape of the Sabines by John of Bologna, and the Perseus of Benvenuto Cellini.

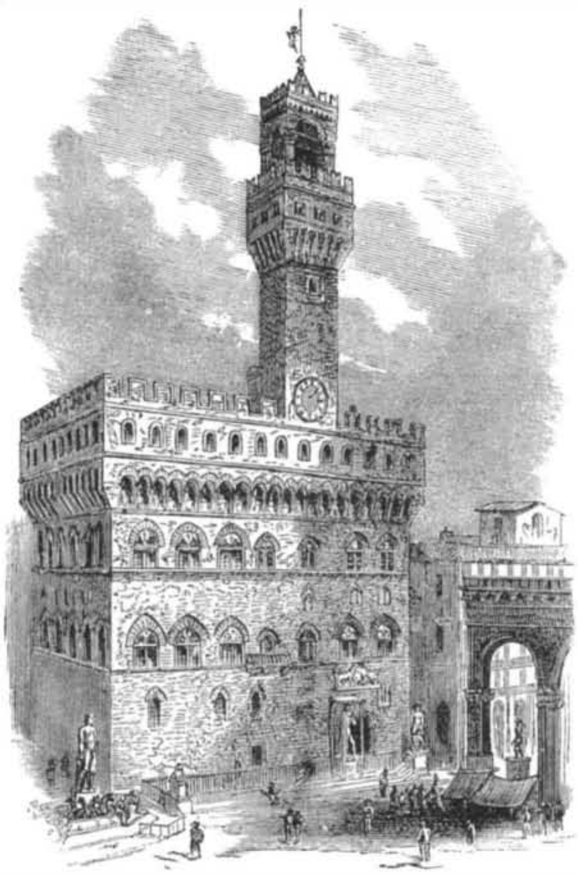
Our second engraving shows the Cathedral with the Campanile designed by Giotto. The great dome, the largest in the world, is the creation of Brunelleschi; and Michael Angelo, when on his way to Rome to undertake the erection of the basilica of St. Peter, is reported to have said that it was not possible to surpass the great work of Brunelleschi. The interior of the Cathedral is at first view disappointing, as the walls are sombre and colorless. But by degrees the simple purity of the proportions and the grand sweep of the dome impress the spectator; and the richly jeweled windows, which at first are overlooked on account of their smallness, soon attract the eye and add to the general effect.

The Campanile is the pride of Florence, and concerning it Mr. Ruskin says: "The characteristics of power and beauty occur more or less in different buildings, some in one and some in another. But all together, and all in their highest possible relative degrees, they exist, as far as I know, only in one building in the world—the Campanile of Giotto, at Florence. I remember well how, when a boy, I used to despise that Campanile, and think it meanly smooth and finished. But I have since lived beside it many a day, and looked upon it from my windows by sunlight and moonlight, and I shall not soon forget how profound and gloomy appeared to me the savageness of the Northern Gothic, when I afterwards stood, for the first time, beneath the front of Salisbury Cathedral. The contrast is indeed strange, if it could be quickly felt, between the rising of Salisbury's gray walls out of their quiet swarded space, like dark and barren rocks out of a green lake, with their rude, mouldering, rough-grained shafts, and triple lights, without tracery or other ornament than the martins' nests in the height of them, and that bright, smooth, sunny surface of glowing jasper, those spiral shafts and fairy traceries, so white, so faint, so crystalline, that their slight shapes are hardly traced in darkness on the pallor of the eastern sky, that serene height of mountain alabaster, colored like a morning cloud and chased like a sea shell."

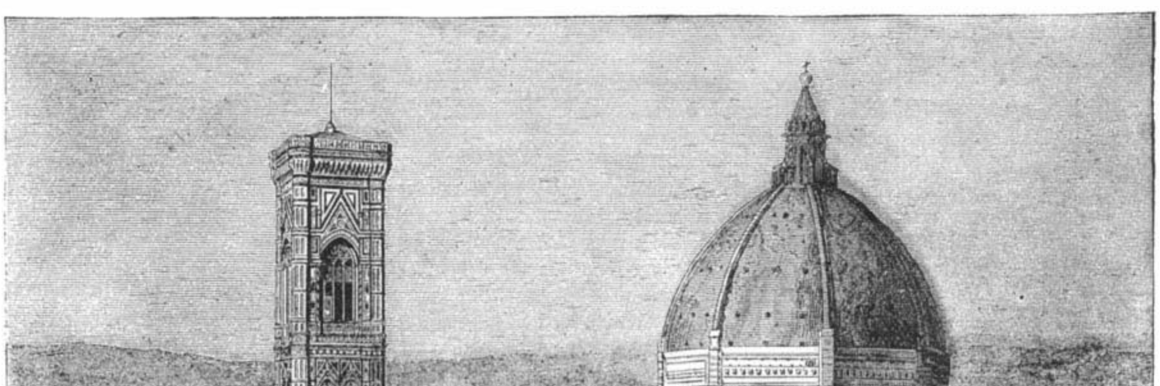
The wonderful tower which has drawn such commendations from the most captious, acute, and sensitive of art critics, was the work of an artist whose early life was passed in the fields, herding sheep. Cimabue was his preceptor, having seen a rough sketch drawn by the shepherd boy. It was simply the figure of a sheep, scratched upon a piece of slate; but it showed such acuteness of observation and ability to portray expression that Cimabue took the young artist into his house and taught him painting. Giotto lived to eclipse his master and to assist Italian art to free itself from the trammels of the Byzantine style. Many of his works are now lost; but his skill and penetrating observation are shown in those which remain, and it is easy to account for his influence over the artists of his time, from Padua to Naples.

There is in St. Peter's, at Rome, a wonderful mosaic picture of Christ stilling the waves of the sea, by Giotto; but it has been so much repaired that little of the original now remains. In Padua he executed a series of paintings, forty-two in number, illustrating the life of the Virgin Mary. To his friendship for Dante may be attributed the allegorical tendency of many of Giotto's works. The wonder and enthusiasm which his works excited has not been paralleled, even in the history of Italian art; and his influence in the art world lasted for a century after his death.

Near the Duomo in Florence is the Baptistery of St John, in which are two bronzed doors, by Ghiberti, which are marvels of art. Michael Angelo declared them worthy to be the gates of Paradise. Not far off is the church of San Lorenzo, with the Chapel of the Medici, in which are Michael Angelo's statues of Day and Night, and of Giuliano and Lorenzo de Medici. Probably in no city in the world are so many masterpieces of genius and skill to be found within a few feet of each other.



THE PALAZZO VECCHIO, FLORENCE.



THE DUOMO AND CAMPANILE, FLORENCE.

Titanium Chloride for Prisms.

In optical experiments and in spectroscopic work, hollow glass prisms filled with bisulphide of carbon are frequently employed because of the high refractive power of the bisulphide. It possesses, however, several disadvantages, among which are its odor and its wonderful solvent properties. The hollow glass prisms employed are nicely ground to the proper angle and plates of glass cemented thereon. The bisulphide of carbon attacks the cement, whatever it may be, and in most cases soon causes the prism to leak. This necessitates the removal of the liquid after using and refilling the prism each day when it is to be used. Cannot some other dense and highly refractive liquid be substituted for it?

It is our wish to call attention to another liquid of very high refractive power, almost equal to bisulphide of carbon, that may perhaps be substituted for it, as it is free from this solvent action, at least on some substances. Titanium chloride fumes in the air, sending off great clouds of white smoke, and is consequently a disagreeable substance to handle. It has, however, the property of remaining in a bottle or other vessel, even when loosely stoppered, for the reason that the fumes of oxide and oxychloride collect about the cork and in all other crevices, completely closing them.

Titanium chloride is prepared in a manner totally analogous to that employed in the chlorides of silicon, aluminum, and some similar substances, namely, the action of dry chlorine gas upon a mixture of titanium oxide and lamp black at a high temperature. Although a difficult laboratory experiment, it might be produced on a large scale almost as easily as chloride of aluminum, if the demand for it were sufficient.

Potassium Xanthogenate as an Antiseptic.

Not long since we recorded the discovery of remarkable antiseptic and conservative properties in the well known bisulphide of carbon. Unfortunately this substance is exceedingly offensive to smell and taste, poisonous, combustible, and even explosive if mixed with air. If, however, it be mixed with an alcoholic solution of caustic potash, it combines with these substances to form a crystalline substance known as xanthogenate of potassium. This latter salt is quite as powerful as the more offensive bisulphide of carbon.

Zöller, in a letter to Professor Hofmann, states that the antiseptic properties of potassium xanthogenate are certainly not surpassed by those of any other known substance. Even human urine was protected from mould and putrefaction for a long time by the use of a small amount of this substance. A very small quantity of it has kept plant juices and extracts for eight months, whether closed or open, no mould or decomposition taking place, nor is the taste affected, and they can be taken without injury. At the beginning of October, Dr. Grote added some of this salt to wine must, and at the end of three months the must preserved the flavor and sweetness of the fresh juice. Several persons partook of considerable quantities of this preserved drink without suffering any inconvenience. Dr. Zöller expresses the belief that the xanthogenate will become naturalized in every household on account of its cheapness, ease with which it can be used, non-poisonous qualities, and the small quantity required for the purpose.

Xanthogenate of potassium may be employed in medicine, both externally and internally; and to avoid the action of potassium on the system, the xanthogenate of sodium could be used for medicinal purposes.

How to Make Printing Plates by Photography.

M. Boivin, who is perseveringly pursuing his labors and interesting researches, has written a description of a very facile process to obtain engraved plates capable of being printed in an ordinary printing or engraving press. Unfortunately it is impossible, so far, to reproduce half tones by these means; but nevertheless, the process will be valuable for reproducing linear designs and sketches. When it is desired to produce a block or printing plate in relief, a sheet of zinc or copper is taken, $\frac{1}{8}$ or $\frac{1}{5}$ inch in thickness. After having grained the surface, it is coated, in a warm condition, with a light film of wax. To this film you transfer a carbon print by ordinary means, and having developed it, it is dipped into alum solution, and dried. Then the plate is plunged into some solvent of wax—benzole, for instance—and in this way those portions of the metal surface not covered by the image are laid bare, ready to be etched with acid; the layers of wax and carbon in the other parts are sufficient protection against any mordant that may be used. It need scarcely be said that, when blocks for the printing press are desired, a negative cliché must be made use of; while in that produced off a plate to be printed in an engraving press, a positive image must be employed. Nevertheless, an ordinary negative may also be employed in the latter case; only, if this is done after having produced the carbon picture, the plate must be covered with a film of copper by the electrotype process. The image may be removed by hypochlorite of lime and boiling water, and then the wax with benzole, and finally acid is employed to etch. In the latter case the copper constitutes the reserve, while the bare zinc plate is etched by the acid. The success of this process of photo-engraving is assured, according to M. Boivin, if use is made of very clear negatives, presenting opaque blacks and whites free from fog. It is indispensable, also, that the pigmented tissue has never been exposed to light previously. M. Boivin finds that the employment of wax is more facile than that of asphalt dissolved in the benzole, recommended by M. Markl for an analogous process.—*E. Lacan, in Photographic News.*

The Treatment of Iron for the Prevention of Corrosion.

Professor Barff recently discoursed on the above subject in a lecture delivered before the Society of Arts, London. He said: "While experimenting, two or three years ago, with my friend, Mr. Hugh Smith, on different methods for preventing incrustation and corroding of steam boilers, I was led, through the failure of all the processes employed, to believe that, if it were possible to convert the surfaces of iron plates into the magnetic or black oxide of iron, in such a manner that the particles of black oxide formed in the position of the original particles of iron could be rendered perfectly adherent to the iron surface, which does not become peroxidized, and perfectly coherent with one another, the object would be effected. I do not intend to enter into the chemistry of the oxidation of iron to its full extent; it would take too much time, and it would rather tend to confuse than to enlighten those who are not well up in their chemistry, and would raise questions which would bring on prematurely a collision with the views of some of my brother chemists: which collision, under suitable circumstances, at some future time not very remote, I look forward to with considerable satisfaction, as it will be the means of solving many phenomena which have never yet been explained. A piece of dry iron, its surface being polished, may be exposed for any length of time to dry air without rusting, but it begins to rust at once as soon as the slightest moisture comes in contact with it. We have to consider only two oxides of iron: one containing 56 parts by weight of the metal to 16 parts of oxygen, and the other containing twice 56 parts of iron and three times 16 parts by weight of oxygen. We speak of these oxides as the protoxide and sesquioxide, or as ferrous and ferric oxide.

"Immediately the protoxide is formed, it being more moist, it unites with oxygen and becomes gradually converted into the ferric oxide. Now, let us suppose a moist iron plate to come into contact with oxygen. It is clear that the protoxide will be first formed, and this rapidly becomes converted into the higher oxide. Now, suppose you take a solution of the salt of the higher oxide and put into it metallic iron; in time, the air being excluded, this higher salt will become converted into a salt of the lower oxide. Let us now see how this bears upon the rapid oxidation of iron in the presence of moisture. We have seen that when oxygen comes in contact with moisture the first oxide is formed and becomes rapidly oxidized into the higher one. But this higher oxide is in contact with metallic iron, which will reduce it to the lower oxide, thus becoming oxidized by the oxygen which it has taken up from the higher oxide. You will now see clearly how it is that iron rusts throughout its whole substance with such rapidity, for the oxide of iron serves as a carrier for atmospheric oxygen to the iron to almost any depth. There is another oxide of iron, called the black or magnetic oxide, containing three times 56 parts by weight of iron and four times 16 parts by weight of oxygen. Some chemists consider this oxide to be a sort of mixture of the two others, and they call it ferroso-ferric oxide; whether this be the case or not does not matter to us this evening. But it is a most important point for our consideration, that this oxide undergoes no change whatever in the presence of moisture and atmospheric oxygen. Nor does any temperature to which it can be exposed, in any of the ordinary uses to which iron is applied in the presence of moisture, either decompose it or produce its further oxidation. In every school where chemistry is taught, in the most elementary lecture on hydrogen, the pupils are told that, if they pass steam over red-hot filings contained in an iron tube, they will be able to collect and burn hydrogen gas at the opposite end of the tube to where the steam enters. For a long time it was thought that the particles of black oxide formed by this decomposition of the steam were pulverulent, and could not be made to cohere into a solid mass. The result of a considerable number of experiments has been to prove that they can be made not only coherent amongst themselves but adherent to the body, and that both these produce a proper formation of this black oxide on the surface of iron plates; for, as I will show you later on, the oxidized surface of the iron resists for a long time, and more effectually, the rubbing with emery paper, than does the simple metallic iron itself, and that there is a very manifest difference between the ease with which a sharp rasp is able to cut away the surface of the iron and the difficulty with which this black oxide is removed from the surface by that same instrument. The method, which long experience has taught us is the best for carrying out this process for the protection of iron articles in common use, is to raise the temperature of those articles, in a suitable chamber, say to 500° Fah., and then pass the steam from a suitable generator into this chamber, keeping these articles for five, six, or seven hours, as the case may be, at that temperature in an atmosphere of superheated steam. I will presently call your attention to the diagram of the furnace and muffle which I have employed in all our later experiments, and in which all the specimens before you, which will be alluded to in this paper, were prepared. Differences of temperature are employed where different objects are to be obtained. If it be wished to act upon surfaces of polished iron or steel, it is desirable to let the temperature remain at 500° Fah. until the operation is completed. Articles coated in this way will not resist the action of continued moisture, such as has prevailed for the last two months, when exposed out of doors; but they will resist the action of any amount of moisture with which they may come in contact in a house or building; and the reason of this will be very obvious, because only a thin film of the iron on its surface is transformed into the black oxide. This I will explain more fully to you when I call your attention to individual specimens. At a temperature of 1,200° Fah., and under an exposure to superheated steam for six or seven hours, the iron surface becomes so changed that it will stand the action of water for any length of time, even if that water be impregnated with the acid fumes of the laboratory. Before calling your attention to our failures and successes as they lie before you on the table, I will just allude to a few of the uses to which this process may be, as I consider, successfully applied—to water mains, also to water-connecting pipes, as well as to the water pipes used inside the house, which, in this case, would supplant their leaden predecessors. In this hall of hygiene, these words will, doubtless, sound as sweet music to the ears of many of those who have honored me with their attendance this evening. The greatest objection to the use of iron pipes for the supply of water in houses hitherto has been this: that by rusting they caused the first quantities of water drawn off in the morning to be dirty and turbid; now this will be entirely prevented if the pipes be first exposed to the treatment which I have just explained to you—of course gas pipes could with advantage be similarly acted upon—and as the surface, when oxidized, is harder than the natural surface of the iron, the friction of large bodies of water through the pipes, and the friction necessarily employed in fixing them in their places, would be much better resisted than by the untreated iron itself. I cannot overestimate the advantages which the employment of this process must confer on architects, who will be by it enabled to employ iron, whether wrought or cast, much more largely, not only in the decoration but in the construction of their buildings. Last summer I was at a very large house in the country where the entrance portico, some twenty feet high, was being painted and decorated, when one of the large plaster ornaments of the ceiling broke away from its holdings, and would have fallen to the ground except that it was caught by a workman. This ornament weighed not less than twenty-five pounds, and if it had fallen from this height upon the workmen below it must have killed them. The ornament had been there many years, and was fixed up in the best method possible, it being supported and secured by iron rods. On examination I found that these rods were rusted through completely to the very center. I need not make any comment upon this, since I have been able to introduce you to iron treated in such a way that it will never rust. Of course, if the process will answer for architectural ornaments, it will answer for statues, so that iron may be used instead of bronze, which will materially lessen the cost of casting statues, both in the material and in the expense of making the moulds. You well know that when a tinned saucepan is allowed to get dry on the fire and burns, as the servant calls it, so that it is rendered useless until it is tinned again. Now, if such a saucepan be treated by the method I recommend, it may be allowed to get red hot without suffering injury, for the protection on its surface is produced at a red heat. We have experimented on some screws, hinges, locks, keys, bolts, with complete success. It has been suggested to me that the iron nipples used in gaslights would not corrode, and would, therefore, be more useful, if submitted to this action of superheated steam. Wherever iron is used, railings, street gas posts, iron safes for keeping documents fireproof and thief-proof, the framework of filters, tanks, cisterns for domestic and other uses, iron employed in the erection of temporary buildings—which I flatter myself, if treated by this process, would become permanent buildings—all these, and many other applications of iron to the arts, would immensely gain by being submitted to this oxidizing action. I think I need hardly take up your time by enumerating other applications for the preservation of iron, for it appears to me that they would be commensurate with most of the uses to which iron is applied, save and except those where friction—such as that to which rails and iron wheels are exposed—would necessarily wear away the coating, as they wear away the material itself. I am happy to see a namesake of mine here present this evening, who will tell you that he is carrying out a process for the manufacture of peat into charcoal by the action of superheated steam, and that he is enabled, by superheated steam alone, to raise the temperature of his chambers to a red heat, quite sufficient to effect his carbonizing process."

Planting Trees for Profit.

A correspondent of the *Ohio Farmer* thinks that trees "can be grown as easily as corn," and also, under some circumstances, with considerable profit. An acre of soft maple trees planted in rows 8 feet apart, with the trees two feet in a row, would prove a remunerative venture, as ten trees, twelve years old from the seed, will make a cord of wood. The writer gives some interesting examples as follows:

"One of my neighbors, in the spring of 1850, started a locust plantation of some acres on rather thin land; he planted the seed in hills four feet apart each way. The seed was prepared by pouring boiling water over it; and after it was swelled plump, several seeds were dropped in each hill. The seed came up well, and the plants were cultivated for two or three years. As soon as they were large enough for bean poles, he began to thin them out, and afterwards, again, for fence stakes. In eighteen years he cut them off clean and sold them for posts, receiving several hundred dollars per acre, and paying off a mortgage on his farm. They are now growing much faster than before, and in about twelve years from the former cutting will be as large as they then were. On another farm in my neighborhood there was growing, when I moved here in 1848, a double row of locust trees that had been set out to shade a short lane. There were forty trees in two rows, four feet apart, and the trees stood from four to eight feet apart in the row, allowing one rod in width; the ground occupied was one tenth of an acre. When these trees were twenty-five years old, they were cut, and made 400 first-class posts (averaging ten to the tree), and the wood and fence stakes made from the limbs more than paid for the work of cutting and splitting. It is now nine years since the original forty trees were cut, and I find nearly 300 trees have come from the stumps and roots to take their place; 180 of these are now nearly or quite large enough at the butt for posts, and, from the present rate of growth, I am satisfied that, in fifteen years from the former cutting, they can be cut again and make over 1,000 posts, and at the same time leave 100 or more trees growing that will be from four to six inches in diameter.

"Under any possible circumstances, timber must command high prices in the future, and I believe that those parents who wish to make an investment for their children, combining perfect safety with a certainty of profit, cannot do better than to plant timber; it will require no care after it is started, and cannot fail to be profitable."

The Uses of Evergreens.

We extract the following from an address recently delivered by the Hon. H. W. Lord, at Pontiac, Mich.:

Within the last twenty-five years evergreens have greatly multiplied, during which time many new varieties have been introduced; nurserymen have learned to propagate them cheaply, and in such manner that they may be transplanted with certainty, so that they are within the reach of all who have grounds on which to plant them, and with taste and usefulness. Now one cannot travel far through the country without finding here and there fine displays of them, adorning and sheltering the homesteads of the farm as well as the urban and suburban dwellings.

Some ten years ago the writer purchased of a nurseryman at Detroit 1,000 little white cedars, the *arbor vitæ*; the plants were one year old from the seed, about six inches high, and cost one and a half cents each—$15 per thousand. Besides planting many of them in groups or singly about the house and grounds, a sufficient number were used to make a hedge or screen on the westerly and northerly sides of a large garden which had been very much exposed to the sweep of blasting winds, sometimes to the destruction of nearly all the early plants that it contained. These cedars, set out some two or three feet apart, all grew luxuriantly, and they now form a living wall about twelve feet high, as impervious to the winds as if built of brick or stone, affording a complete protection to the garden, and more than doubling its value for the purposes of its use. Delicate plants, that one blast of cold wind in a May morning would chill and destroy, now, no matter how bleak the gusty day, seem to nestle in the warm sunshine, unconscious of harm.

This is a cheaply obtained refuge that one may profit by, and an inexpensive ornamentation in which one may indulge. When rough wintry tempests seem to shake the earth, when you hear them howl about your window panes, driving December rains almost through them, when your fires burn briskly, but do not warm your house: then you may reflect that, had you a few years before planted your grounds thickly with a variety of evergreens, in the direction whence come the prevailing storms, the trees would overtop your dwelling and afford you a "hiding place from the wind."

If, in the place of our fences, all the roadsides, and the dividing lines between all fields or divisions of ownership, were lined with rows of evergreens twenty to fifty feet high, it is probable that we should hear no more of winter killed wheat, or very little. The expense would be small in the first instance compared with fencing. Ten evergreens to the rod would be sufficient, and would cost fifteen cents, and the labor of planting about as much more. But how about the cattle? Well, that is a question of considerable magnitude. It is our opinion that they should never be allowed to leave the inclosures provided for them about the barns and sheds.

It is not likely that many in this hall will live to see the day, yet we believe it is not very far distant, when there will be no fences in Michigan, except those provided to keep animals away from the fields, rather than to confine them in them. Farmers themselves, severely as they feel the weight of their expenses for fences, are as a rule unaware of the enormous burden of them, and how much it costs to perpetuate the incumbrance. If to the westward and northward of each farmer's farm and cattle yards a belt of evergreens were planted, they would in ten years form as complete a protection as a stone wall fifteen feet high, and be better every way, affording a hiding place from the winds, that sweet-breathed cows, and oxen, and gentle sheep would regard as a special providence, and for which they would repay their owners many fold. Belts of evergreens planted on the exposed sides of orchards afford such a hiding place from the winds that trees so protected have been observed to be fruitful, when others in bleak situations have utterly failed.

When these truths shall be fully appreciated, and the further truth that every three acres will sustain as much stock in the yard as five acres will in the field, then farmers will begin to inquire if fences cannot be dispensed with; and when they shall realize how destructive to crops it is to let the winds go wholly at large, then they will begin not only 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_2, F_6, by means of metallic sodium. The metal will decompose steam with difficulty, acts feebly on acids, more easily on alkalies. 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 $Es\,Cl_4$, will boil at 212° Fah., or perhaps lower; its vapor density will be about 1·9 at 32° 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 Li 7	Be 9·4	B 11	C 12	N 14	O 16	F 19	
Series 1..........	Na 23	Mg 24	Al 27?	Si 28	P 31	S 32	Cl 35·5	
" 2..........	K 39	Ca 40	Ga 44	Ti 48	V 51	Cr 52	Mn 55	Fe 56, Co 59, Ni 59, Cu 63.
" 3..........	(Cu 63)	Zu 65	? 68	Es 72	As 75	Se 78	Br 80	
" 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	....	Ur 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_3	RH_2	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 ½ per cent of zinc, which when it has risen to the top is removed as before and dried. A third addition of ¼ per cent of zinc is found necessary to take out the remainder of the silver, care being taken on the cooling of this zincing 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 zincing 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 recovered 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 dezincifying 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 1¼ 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 enameled, 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 ISETTS, 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 t e 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 assig ee or assig ees, for the whole or part of