Imitation of Wood Mosaics.

Hugo Riha describes the following neat method of imitating mosaics in wood: The smooth pine board is painted with three or four coats of dull white for a ground. When dry it is ground with *ossa sepia*, well dried with a piece of buckskin and left a day standing. A thin liquid paint is made by grinding the finest ivory black with turpentine on a glass plate, very fine, and mixing thoroughly with a mixture consisting of three parts of ordinary copal varnish and one part turpentine. This is applied evenly, with not too stiff a brush, upon the white tablet, and graded down very fine and delicately with a badger's hair grader. After two hours the paint dries so solid that work may be begun on it. The tablet is placed on an inclined position and the drawing of the design, the outlines of which have been pricked through the paper with a needle, is laid upon it, and reproduced on the black surface by striking it gently with a bag filled with finely ground chalk, and after removing the paper the outlines will be found in white upon the black background. The design is next painted over with a solution of calcined soda. In two or three minutes afterwards the painted part is washed with a piece of sponge dipped in water, with a circulatory motion of the hand and arm. With a little rubbing the black paint is removed from the portions where the soda was applied. The washing with clean water and sponge is repeated until the design appears in white. This, of course, is the white ground that was under the black. This surface is then dried with a piece of buckskin. By this process the white portion is depressed while the black portion which did not come in contact with the soda remains raised. The colors are now applied to the white portion to imitate the different kinds of wood; and where two kinds of wood are to be matched together, a strip of adhesive paper is pasted along the line where they are to meet, and one kind of paint applied up to the paper. When dry the paper is removed and placed over the painted part and the other color applied. When the design is completed it may be varnished and polished. As the paint applied does not form a thicker coat than the black which surrounds it, the work has the appearance of natural wood mosaic inlaid in a black groundwork, instead of being raised from it as in the usual method.

Making Wrought Iron and Steel.

In a paper on the direct process of making wrought iron and steel read before the Franklin Institute, Mr. Charles M. Dupuy recently gave many interesting facts, from which we make selections.

Forged iron is made by the "direct" and "indirect" methods. By the primitive direct method 400 or 500 lbs. of ore, mingled with charcoal, are subjected to the action of blast for 3 or 4 hours, when it becomes imperfectly matted together, and is transferred to the hammer, where its earthy impurities, being melted, are removed by pressure. This process secures a high grade of iron, at a cost of about 300 bushels of charcoal and great waste of ore to the ton of iron. The "indirect" method treats large masses of ore, carbon and fluxes in the blast furnace. The earthy impurities are mainly tapped off, but still the pig iron may be said to be a compound of iron, carbon, silica, and other substances which require a second melting, and laborious manipulation to purify the metal for forging or rolling.

The devices for improving and cheapening iron by the direct method have been numerous, for the superiority of the metal thus treated had been observed. In 1791 Samuel Lucas patented a process for reducing ores with carbon in airtight pots, and in 1794 Mushet forged iron which he had reduced in a crucible. The simplest method, by reduction of ores in crude clay pots, seems to have been known from the earliest times. A fresh pot for every operation was, of course, too expensive, and devices have been invented by which ore could be deoxidized and the vessel used over and over again.

In a long series of experiments on iron reduced in close pots, Mr. Du Puy found that ore and carbon are such perfect non-conductors that the highest heat penetrates from the outside very slowly through a thickness of about 3 inches of this substance, and that to add 2 or 3 inches thickness of crucible, or containing vessel, practically defeats complete reduction in a sufficiently speedy time to be successful. He also found that a white welding heat was necessary to thoroughly reduce the ore. Crucibles of any refractory material sufficient to withstand this heat are costly at first, and in frequent renewals; besides the material would soften, and incorporating with the metal, deteriorate it. To secure the advantages of the "close pot" it became evident that some substance should compose it that should withstand the high welding heat, and be homogeneous with the metal, and finally, when its work was done, and the ore changed to metal, would weld up with it.

As it is estimated that every pound of silica ordinarily carries with it about three pounds of iron, it occurred to Mr. Dupuy to create for the silica a greater affinity than it has for the metal, by mingling alkalies, and to so proportion them, that the glass thereby produced by not combining with it, should not only save the iron, but that it should be further utilized by forming particles of glazing or varnishing material, covering the little particles of metal as formed, and thus protect them from furnace reoxidization. This step proved effective. Now the alkalies in quantity, and kind, having been determined by an analysis of the ore, they are mingled with it along with the carbon, and are all pulverized together, by being thrown, in the proper proportion, into an ordinary Chilian mill, such as is used in Western rolling mills for grinding the "*fix*," and from thence shoveled at once into the canisters, and charged into the furnace.

It will be observed that a triple chemical operation begins to take place at once, from the moment the canisters are charged into the furnace.

First. The oxygen of the ore combines with the carbon, passing off as carbonic oxide.

Second. The silica and alumina combine with alkalies introduced, and form the glazing material which cover the particles of newly made metal, effectually sealing these particles from reoxidation from the furnace gases.

Third. The phosphorus melts into this glass, and passes off with it as a slag, not contaminating the iron.

If it is desired to make steel, the canisters, filled as described, are charged on end into the furnace on a layer of coke, a few inches in thickness, so as to allow the heat to penetrate from the bottom, as well as sides and top. They are usually placed 7 or 8 inches apart to secure a radiation of heat between them.

In the course of from five to seven hours, according to the strength of the heat, the ore will be reduced from its oxide and settle down into almost a solid metallic mass, so firm as to be separated and broken with great difficulty, even in its highly heated state in the furnace. In this solidified condition it is removed and hammered, or thrown into the squeezer and rolled to muck bar, at this one first heat. It is then cut up, reheated and piled, with the usual loss of 8 to 10 per cent of ordinary piled iron. This stock is then fitted for the steel pot, producing all grades of steel, up to the highest, without mixing with other stock, but by simply varying the carbon.

If iron is required, as soon as the metal has separated from its impurities, precipitated to the bottom, and covered with slag, the operator at once rolls it up in balls and subjects it to the hammer or squeezer. No excessive labor is required in stirring the metal, as is required to decarbonize pig iron, for this metal has been deoxidized without labor, simply by the chemical action of heat on the material; and there is no excess of carbon to eliminate. It has also separated itself, in the liquid state, by specific gravity, from its metalloids altogether, without the aid of physical labor. Finally, as it lies at the bottom of the furnace, it is incorporated with just sufficient carbon as is needed by the operator to produce the grade of metal required.

The ore, carbon, and fluxes, as has been proved by working, may all be ground together and charged into the canisters at an outside cost of 40 cents per ton of ore; when systematized, 30 cents per ton will be sufficient.

It will be found that muck-bar may be produced a few dollars per ton above the cost of pig iron; that it will rank with the highest grades of wrought iron for special purposes; and that the plant is so simple and inexpensive, as to make a large reduction in the interest account of all ironworks. Besides this, it will be found that the process is so greatly under the control of the operator, as to enable him to make such mixtures as to produce the exact quality of iron or steel desired, not being subject to the irregularity of the blast furnace. This direct process, in a word, reduces the exact results of the laboratory to a large and intelligent practical working basis for the manufacture of iron and steel.

Astronomical Notes.

BY BERLIN H. WRIGHT.

PENN YAN, N. Y., December 22, 1877.

The following calculations are adapted to the latitude of New York city, and are expressed in true or clock time, being for the date given in the caption when not otherwise stated.

PLANETS.

Mercury sets	5 56	evening
Venus "	8 18	"
Mars in meridian	6 18	"
" sets	0 30	morning
Jupiter "	5 21	evening
Saturn in meridian	5 1	"
" sets	10 33	"
Uranus rises	9 15	"
Neptune in meridian	8 6	"
" sets	2 50	morning

FIRST MAGNITUDE STARS.

Sirius rises	7 32	evening
Procyon "	7 7	"
Betelgeuse "	5 16	"
Regulus "	9 11	"
Aldebaran in meridian	10 22	"
Vega sets	9 21	"
Altair "	8 8	"
Fomalhaut sets	8 45	"
Capella in meridian	11 0	"
7 stars (cluster) "	9 33	"

REMARKS.

The sun entered the constellation *Sagittarius* and attained his greatest southern declination (23° 7′ 26″) December 21. Twilight begins in the morning at 5 h., 42 m., and ends in the evening at 6 h., 14 m., having lasted in both instances 1 h. 39m.

All the planets are advancing or moving eastward among the stars, except Uranus and Neptune, which are retrograding. Mercury is now brightest, and can be seen in the west in early evening. He sets 1h. 25m. after the sun, and almost at the same point in the horizon (½° south). He is between Venus and Jupiter, having almost the same declination as the latter and setting 35 m. later. His color will serve to distinguish him from Jupiter and stars. Only 0·226 of Venus' illuminated disk is visible, yet on a clear moonless night she will now cast a well defined shadow.

White and Colored Troops.

The recent annual report of the Surgeon General gives somes figures in regard to the health of the army during the fiscal year ending June 30, 1877, which are interesting. The average mean strength of the army was 23,284 white men and 2,075 colored men. Among the white troops the total number of cases of all kinds reported as taken on the sick list was 40,171, or, taking the average, each man was sick less than twice a year. The average number constantly on sick report was 1,026, or about one twenty-second part were sick all the time. The total number of deaths was 260, making the proportion of deaths from all causes one in one hundred and fifty-five. Among the colored troops the total number of cases was 4,348, or each colored man was sick on the average more than twice a year. The average number constantly sick was 99, or about one twentieth. The number of deaths was 32, or one in one hundred and thirty-six. Comparing the ravages of disease among the two races, we find that 1,482 per 1,000 strength of white men suffered, against 1,821 per 1,000 strength of colored men, the proportion being about 20 per cent against the latter. In deaths, however, we find the proportion reversed, for only 7 per thousand of colored men died of disease, as against 8 per thousand of white men. In cases caused by wounds, accidents, or injuries 8 per thousand negroes died, against 3 per thousand of white men. It thus appears that the negroes become diseased more easily than white men, and also recover more easily; but when actual bodily injury occurs they die more than twice as fast as white men.

It is easy to follow out this line of thought in case of actual warfare. The negro troops would be more subject to sickness and when wounded would die quickly. The white troops would be less liable to succumb to disease, though when afflicted the percentage of recovery would be against them. But on the other hand they would recover more easily from their wounds, which are after all the most serious troubles to be met with in war. Disease can be guarded against, but wounds can not. The superiority of the white to the colored soldier would thus seem to be in measure a proved on the score of health alone.

Heat Waves.

Professor Piazzi Smyth, of the Royal Observatory, Scotland, says that the coming winter is to be exceedingly cold. From the observations of earth thermometers over a period of 39 years, he finds that between 1837 and 1876 three great heat waves from without struck Great Britain, namely: The first in 1846·5; the second in 1858—0, and the third in 1868·7. The next one will probably come in 1879—5, within limits of half a year each way. The periods of minimum temperature, or greatest cold, are not in the middle time between the crests of these three heat waves, but are comparatively close up to them, on each side, at a distance of about a year and a half. Hence the next cold wave is due at the end of the present year, and very frigid weather may be looked for.

NEW BOOKS AND PUBLICATIONS.

WHITWELL'S IRON SMELTER'S POCKET ANALYSES BOOK. By Thomas Whitwell. John Wiley & Sons, Publishers. New York. Price $2.

The want of a pocket analysis book, properly prepared for the various materials used in an iron or steel works, or by the metallurgical engineer will be fully supplied by this choice little work. It contains tables of specific gravities, proportion of weights, melting, boiling, circumference, English and French weights, and other tables of use to the furnace owner or engineer. It is designed for the pocket, and contains room for 450 analyses; its value will increase with the use made of it.

THE CHEMISTS AND DRUGGISTS DIARY. Publishers: 44 Cannon street, E. C., London, England.

This is a volume of great value to chemist and druggists. It contains a dictionary of chemical synonyms, a list of poisons and antidotes, mineral waters, books interesting to pharmacists, a directory of London hospitals, addresses of London doctors, and a dictionary of minerals. Also acts of parliament affecting druggists, botanical calendar and a large diary with ample space for every day in the year. A similar work for the profession in this country would undoubtedly be appreciated.

THE WATER SUPPLY OF SOUTH AFRICA. Compiled by John Croumbie Brown, LL.D. Oliver & Boyd, Publishers, Tweeddale Court, Edinburgh, Scotland.

Mr. Brown has already published valuable works with the philanthropic object of exhibiting the bad results arising from forest destruction and the positive advantages to be gained by tree culture. He has entered with much detail into the effects of forests upon rainfall, and in another work he bas exhibited the benefits of the plan pursued in replanting the Alps and other mountains of Europe with trees and bushes, the object being to arrest and prevent the destructive consequences of torrents. In the present volume he has gathered a large amount of material showing the why and wherefore of the desiccation of South Africa, and pointing out the appropriate means for reclaiming the country. These means it is considered are irrigation, arboriculture and an improved forest economy, or the erection of dams to prevent the escape of a portion of the rainfall to the sea, besides other means of minor importance. A very large number of authorities are cited and the subject is treated with great minuteness.

THE LAW OF PATENTS, TRADE MARKS AND COPYRIGHTS. By Orlando L. Bump. Baker, Voorhis & Co., Publishers, 66 Nassau street, New York. Price $6.00.

This is a very complete compendium of the law as contained in the Revised Statutes of the United States. Notes are given under each section referring to decisions of the courts and the Commissioner of Patents. A valuable table is added, showing the time of the repeal of each act, and other information, so that a lawyer may readily ascertain whether a provision in a statute cited in a decision is still in force, or whether a statute has been so modified as to affect the application of a decision. The rules of practice of the Patent Office and a large collection of forms are appended. Nearly 2,500 cases are referred to and digested, and it is believed that, what with the information contained in the book itself, besides that attainable through its very copious references to original sources, the reader will be furnished with all likely to be required in the investigation of any subject under the laws.

A MANUAL OF VEGETABLE PLANTS. By Isaac J. Tillinghast. Tillinghast Brothers, Publishers, Factoryville, Pa.

This is a neat volume of 100 pages containing the experiences of the author in starting all those kinds of vegetables which are most difficult for a novice to produce from seeds, with the best methods for combating and repelling noxious insects and preventing the diseases to which garden vegetables are subject. It is a handbook of much value to gardeners and embraces a variety of useful information.