WHITE BRONZE.

We illustrate on our front page an industry that has been gradually developing for the past two years—one that has been watched with much interest by those who have a desire to see progress in American art productions, but more particularly by scientists, who have always recognized the merit of the material used, and that it only required time and proper manipulation to demonstrate its desirable qualities and, to them, unquestioned superiority.

The necessity for a more enduring material for monuments than stone has long been felt. It is well known that stone is unable to withstand climatic effects, as described in scientific articles by Prof. A. A. Julien, of Columbia College, New York, Prof. R. Ogden Doremus, and other eminent scientists, and demonstrated by the crumbling condition of the obelisks of New York and Paris, and of all the oldest stone monuments and buildings in this country and Europe.

The enduring nature of the metal used—refined zinc—and its peculiar adaptation to the purpose have long since brought it into use in Europe, where the art has made good progress, taking the place, to some extent, of copper or antique bronze for monuments and statuary. The Prussian Government has recently erected some large statuary of this material, notably the Postal Union statue at Hanover, illustrated in SCIENTIFIC AMERICAN SUPPLEMENT Ure's "Dictionary of Arts," enlarged edition, also refers to the extensive use of the metal in Continental Europe, large foundries being located in Berlin, Cologne, Hanover, and other cities.

From the earliest use of the material there seems to have been but one opinion regarding its enduring qualities. Encyclopedias, standard works on metallurgy and chemistry, and scientists are unanimous in commending its lasting nature; and the facility with which it is moulded into the most artistic designs will ultimately make white bronze more popular for art work than the copper or antique bronze which has heretofore been used so extensively.

The name white bronze was adopted for this perfected and finished material as an appropriate one to distinguish it from the dark or antique bronze, also from the cheap statues made of sheet metal. It is claimed by the manufacturers that white bronze, as now made, is so well adapted to monumental purposes that it will ultimately supersede all other materials. Experience has enabled the producers to overcome the many obstacles that at first presented themselves, principal among which was the difficulty of obtaining metal sufficiently purified to retain its color; this has been entirely overcome.

The monuments and statuary are cast as thick, or thicker than, copper bronze. The designs are first modeled in clay and reproduced in plaster of Paris, from which a wax cast is taken, this cast being necessary in order to procure a perfect metal pattern, from which the monument is moulded and cast in the ordinary way.

Our illustrations show two important features in the production of this work, one being the fusing and joining together of the different parts by pouring molten metal of the same material as the castings, at a high degree of heat, along the joints; this makes them practically one solid piece, and the corners the strongest part of the work.

The other illustration is that of the application of the sand blast, which gives the surface of the work a pleasing appearance which it always retains, being in this respect superior to copper bronze, which soon after exposure becomes black and unattractive.

The work of finishing and preparing for the sand blast requires a high degree of artistic and mechanical skill; with the exception of the sand blast, all the finishing is hand work, and necessarily expensive.

Metal possesses many advantages over stone for monumental purposes aside from its greater durability; the positive assurance of the raised lettering or inscriptions remaining legible for ages is itself worthy of appreciation, as the value of any monument lies in its ability to legibly retain its record. The monuments are made with removable tablets, for the purpose of adding inscriptions in the future. White bronze is also free from the discoloring influences of trees or growths of moss or mildew, and is not affected in the least by the elements of the atmosphere, so destructive to stone.

It is stated that the granite obelisk in Paris, which has only been erected there forty years, has so far decayed that the French Government have taken plaster casts of the surface to preserve the inscriptions for historic use; and our own obelisk, which has only been in Central Park for five years, is already disintegrating from the effects of the climate, and scientific men have been called upon to devise means for its preservation, while the old metal and bronze monuments in Europe, that have stood for centuries in the most rigorous climates, are still as perfect as when new.

Monuments and statuary for cemetery purposes are produced of all sizes, styles, and designs, competent artists being constantly engaged in modeling original monumental designs, as well as statues, portrait busts, medallions, etc., to be used in connection with granite and bronze monumental work. Our illustration shows the artist's studio at the Bridgeport foundry. Among the recent productions were life-sized busts of Martin Luther, for Allentown, Pa.; Sergt. Major Reynolds, of this city, recently unveiled in Greenwood Cemetery; and statue of Pilot Woolsey, erected in Evergreen Cemetery. A large number of white bronze public monuments have been erected, prominent among them being the one shown on our front page, recently unveiled at Grand Rapids, Mich., which was cast at the Detroit foundry; as a monumental fountain it undoubtedly surpasses all previous productions of this nature that have come to our notice.

We illustrate the different art foundries engaged in the production of white bronze, as well as the exhibit made at the World's Fair, New Orleans, at which the goods were awarded the gold medal; a gold medal was also awarded white bronze at the Southern Exposition, Louisville, Kentucky, last fall, also a medal awarded them at the American Institute Fair, 1884, where a fine display of statuary can now be seen. The work is produced exclusively by the Monumental Bronze Company, Bridgeport, Conn., the Detroit Bronze Company, Detroit, Mich., the Western White Bronze Company, Des Moines, Ia., the American White Bronze Co., Chicago, Ill., and the St. Thomas White Bronze Monument Company, St. Thomas, Ont. It is expected that other foundries will soon be established in the West and Southwest.

The time honored custom of using marble and granite for monumental purposes, and the faith that seems to prevail in the enduring qualities of the products of the "everlasting hills," naturally cause a strong opposition to the introduction of metal in this connection; but careful observers have long since noted the shortcomings of marble and granite when exposed for any length of time to atmospheric influences, and they are not content to intrust their family records to such perishable material.

The production of white bronze monuments and statuary has until recently been prosecuted in a quiet, unostentatious way; but with the addition of needed improvements and increased capital, so great has been the development during the past few years that four foundries are now required to supply the rapidly increasing demand. We are living in the age of telegraphs, telephones, electricity for lights and motive power, and many other useful improvements regularly chronicled in these pages, all of which have a value in their peculiar uses, and so with the subject of our sketch on front page.

Iron Ores.

A writer in *Science* gives the following composition as the work of a boy in a New England grammar school:

IRON ORES.

This morning the teacher passed each boy three specimens. One of the boys brought his specimens to the desk, and the teacher tried them with a magnet. One of them was reddish, the other was yellowish, and the other was black. The yellowish one and the reddish one we found was not magnetic, but the black one was magnetic. These specimens were all iron ore, from which iron is obtained. From the black ore, we found that the best iron was obtained from it.

We were then told to rub each specimen on a piece of paper. The red specimen made a red mark, and the yellow specimen made a yellow mark. From the other specimen, which was black, the most of us could not make it mark on account of its hardness; but our teacher told us if there were some powder on it, we could make it mark a black streak.

Then the teacher took some small pieces of the yellow ore and put them in a test tube, and held the tube over the flame of an alcohol lamp, and each line filed around to see what it formed in the tube, which was water. There was no water in the tube when the ore was put in, therefore it must have come from the ore. This ore is called limonite or bog iron ore, because it has so much water in it, and is found in wet, marshy places. The name of limonite came from a word meaning meadow.

The teacher then took them out of the test tube, and tried them with a magnet, and found they were not magnetic. It was proved that they were not pure iron, because they would not stick to the magnet.

We found that these pieces of iron ore contained iron and oxygen, therefore they were iron oxides. When these pieces were rubbed on paper, they made a streak like the red ore. The name of this red ore is hematite, which means blood red. Hematite is composed of iron, oxygen, and no water; and once it was supposed to be limonite, and the water driven out of it by the heat of the earth.

Teacher then took the pieces of limonite which was heated in the test tube, and put them in a piece of charcoal, which is a form of carbon, and blew the flame of an alcohol lamp on the charcoal by a blow pipe. After she got most of the oxygen out of the pieces, she then took them on a piece of paper, and tested them with a magnet, and found the smallest pieces were magnetic, because they were heated the most. The black ore is magnetite, which contains the best iron.

Correspondence.

Diamond Mining in South Africa.

To the Editor of the Scientific American:

Ever since diamonds were discovered in South Africa the ingenuity of South Africans has been taxed to invent some method which will prevent the stealing of diamonds by the employes in the diamond mines, but thus far with but little success. It is estimated that $10,000,000 worth of precious stones are annually stolen by the natives and others engaged in diamond mining. Diamonds are found in what is called, from its color, "blue ground," the area of which is well defined. This "blue ground" is loosened with pick, shovel, and dynamite, shoveled into trucks, and hauled to the surface. The ground is then exposed for some days to the weather, which disintegrates and pulverizes it. It is then run through washing and sorting machines. Now, take a man engaged with pick and shovel, wheeling the debris out, emptying it, and returning, and you have a very fair illustration of the work done by the thieving portion of the diamond diggers.

Now, a problem I wish to place before our American inventors for solution is this: What contrivance or appliance would permit a man to carry on his work of excavating, and at the same time prevent his picking up and secreting a pebble?

JAS. W. SILER, U. S. Consul.

Cape Town, Sept. 16, 1885.

Preservation of the Central Park Obelisk.

To the Editor of the Scientific American:

Referring to the article in last week's paper on the decay of Cleopatra's Needle in Central Park, I beg leave to give my experience in such a case. In 1865 I built a stone house for Wm. Duncan, Esq., of Innerleithen, Scotland, under the superintendence of the late David Bryce, of Edinburgh (an eminent architect). He, having doubts of the durability of the stone, gave me a receipt to apply to the exposed surface, the principal ingredient of which is boiled linseed oil. I have never known it to fail.

In the case of the Cleopatra Needle, it would require to be protected from the weather while being treated, the moisture in the stone dried out, and the decayed portions carefully removed; the cracks would have to be filled up with the same preparation mixed with ground stone.

I saw the Cleopatra's Needle last year, and the necessity for such treatment was very apparent to me then. Its decay will be very rapid unless something is done.

We took down the Tennessee Bank building about two years ago. It was built of hard blue limestone, the same as the capitol in Nashville is built of (which is scaling off very rapidly). I found the pillars of the bank in front perfect, while the rear of the building, was much decayed. On examination, I found the pillars had been treated to a dressing of this same preparation.

I send you a small sample of the stopping used in mending one of the pillars, which is made of this preparation mixed with ground limestone, and which has stood the weather for forty years without any alteration.

I have found, where stone has been mended by shellac and a hot iron, that the heat always showed signs of having injured the stone, especially in granite. I am afraid it would not do to apply heat by means of charcoal furnaces; it might do more harm than good.

JOHN OMAN.

Nashville, Tenn., Oct. 30, 1885.

P. S.—In taking off the inclosed sample from one of the old columns, you will see that part of the stone came off, showing how the preparation adhered to it. It also shows how it penetrated into the stone, thereby preserving it from the weather. The sample we send by mail in a separate package. J. O.

Amended Regulation Concerning the Ductility of Steel Boiler Plate.

Supervising and Local Inspectors of Steam Vessels and Others:

It having been ascertained to the satisfaction of the Treasury Department that the regulation requiring a reduction of area of 53 per cent on all steel boiler plates of 65,000 pounds tensile strength and upward is an actual prohibition of the manufacture of such plates, the Secretary has modified the regulation so as to require a reduction of area as follows:

Tensile strength.	Reduction of area.
70,000 pounds	43 per cent.
65,000 pounds	50 per cent.
60,000 pounds and under	55 per cent.

A CORRESPONDENT in Turkey describes a discovery of a cave by two workmen in a colliery near Tyre in Phœnicia. On entering the cave, there were found four sarcophagi, with relief figures of men, trees, flowers, of a very fine workmanship. By breaking a hole in the wall of the cave, a square yard was reached, with two similar sarcophagi, and with a number of earthen and glass vessels. It is supposed that the cave was a burial vault. The sarcophagi will be opened in the presence of the Governor of Damascus.

American Trees in Autumn.

Now that deciduous trees and shrubs are once more beginning to attract the attention which they so well deserve, and which was diverted from them when conifers became such favorites, instead of the monotonous somber green of the pines and their allies we may expect to see more frequently the delicate tints of early spring furnished by the swelling leaf buds or opening blossoms, the manifold shades of green during the summer months, and the brilliant coloration assumed in autumn by many of the fine deciduous trees from North America and Eastern and Northeastern Asia, which were much more generally known at the commencement of the present century than they are now.

If planters would but note the wondrous autumnal changes in the foliage of many deciduous trees, and plant accordingly, they could easily create such effects as would as much surpass the ordinary haphazard style as a picture by a "Turner" would be superior to another painted by a schoolgirl. With care, too, the summer tints might be made to thoroughly harmonize, so that at all times the individual beauty of a tree might be enhanced by judicious contrast. Trees with totally different habits might also be chosen, so that, even when leafless, the tracery of the branches would be a source of artistic enjoyment. My remarks are, however, confined to autumnal tints and to trees and shrubs which are most noticeable at the present moment. Many of these are somewhat uncommon, all are strikingly handsome, and even the common one deserves to be more generally known and appreciated.

For truly gorgeous coloration in autumn, some of the American oaks bear off the palm. Perhaps the most beautiful is the quercitron oak, of the eastern United States (Quercus tinctoria), the fine, deeply-lobed foliage of which, in autumn, exhibits a lovely combination of dark, glossy green, crimson, and reddish brown, the green occupying generally the central portion of the leaf. Quercus rubra (the red oak) and its varieties are especially noteworthy; in these the redder tints of the decaying foliage are more unalloyed with other shades, so that in the sunlight the leaves brighten up and glow as if they were on fire. Q. alba (the white oak) is a noble tree with large leaves, brownish red being the prevailing shade in autumn. The chestnut oak (Q. prinus) and its varieties, with their large, chestnut-like leaves, are hardly less beautiful than the quercitron and red oaks, and assume autumnal colors in which bronze and reddish purple predominate.

Totally different in color and habit of growth are the hickories, two of the most showy in autumn being the pignut hickory (Carya porcina) and the small fruited hickory (C. microcarpa), from the eastern United States; both have walnut-like foliage, and the large leaves of the first die off a uniform rich golden yellow. The yellow wood (Cladrastis tinctoria), from Kentucky and Tennessee, is one of the handsomest of the flowering trees of the locust kind; in early autumn it is clothed with large pinnate leaves of a fine orange yellow. The bird cherry (Prunus padus), particularly when planted in open ground, has leaves tinged with rosy red when dying, and one of the prettiest effects I have ever seen was a fine group of bird cherries with a background—a few yards away—of dark, glossy, evergreen shrubs.

The June Berry (Amelanchier canadensis), although not possessing the delicate tints of the last named, wonderfully enlivens the autumn shrubbery with its red-brown leafage. The red mulberry (Morus rubra), from the eastern United States, is very conspicuous in October on account of its sulphur-colored, prettily lobed leaves; it is a small tree, and, with a background of dark green such as that afforded by the evergreen oak (Quercus ilex), is most striking. The blue beech (Carpinus americana) is a small tree from 10 feet to 20 feet high; its decaying leaves exhibit a charming combination of green, golden yellow, light red, and crimson. The South European Acer opulus furnishes us with a mixture of purplish, orange scarlet, and brown tints. The cherry birch (Betula lenta) of the northern and northeastern United States makes a fine object when covered with clear, golden yellow foliage, which is especially attractive in sunlight. The black or sour gum, or pepperidge—for under all three names is Nyssa multiflora known in its native haunts, the eastern United States—has fine, bold, glossy leaves, assuming in early autumn a brilliant orange-scarlet color; an accidental combination of this with a specimen of Ptelea trifoliata, with its lemon-yellow, pinnate foliage, produces a very happy effect.

The Silver Leaf Maple (Acer dasycarpum), which, on account of its rapid growth and beautiful foliage, is much planted as a shade tree in the United States, is one of the finest of deciduous trees. In early spring it is covered with myriads of reddish flowers; then its handsome leaves, green above, silvery white below, turn in autumn to a golden yellow. The red maple (Acer rubrum), more compact in form and less rapid in growth than the preceding, is also very ornamental in autumn, and in spring its deep red blossoms render it conspicuous and beautiful. The sugar maple (Acer saccharinum) is one of the noblest of American trees, and is much valued both for its wood and for the beauty of its form and foliage; in summer its leaves are a light green, but in autumn are a clear yellow. The tulip tree (Liriodendron tulipifera) is one of the largest and most beautiful of North American trees; as an ornamental tree it is at any time hardly surpassed, but in October, when its foliage is suffused with a rich golden glow, it is especially striking, a fine specimen making quite a feature in the landscape. The brilliant autumnal colors of the sweet gum (Liquidamber styraciflua) are too beautiful to be passed over without notice; rich orange-scarlet, crimson, and yellow give place in some individuals to a dull purple, the long-stalked, star-like leaves, when well covered, being especially handsome. This tree retains its rich leaf coloring for some weeks.—*Q., The Garden.*

APPARATUS FOR THE RECOVERY OF TAR AND AMMONIA FROM BLAST FURNACES.

One of the most important questions of the present day in connection with blast-furnace practice is that of the recovery of tar and ammonia from the furnace. This was evidenced at the recent meeting of the Iron and Steel Institute, at Glasgow, by the interest shown in the paper on that subject by William Jones. In that paper reference was made to the apparatus for dealing with this subject designed and patented by Mr. John Dempster, of the firm of R. & J. Dempster, of Newton Heath, Manchester, and which is now in operation at Messrs. R. Heath & Son's works, near Stoke-on-Trent, being the only works which has yet attempted the recovery of tar and ammonia from blast-furnace gases in England. This apparatus is illustrated in our present issue, where Fig. 1 represents a perspective view of the works, our illustration having been engraved from a photograph. Fig. 2 shows a plan of the works, the various details of the plant being indicated thereon. Mr. Dempster, being a gas engineer and constructor of gasworks, has adopted apparatus generally used in ordinary gasworks, but adapted to the special requirements of blast-furnaces. The blast-furnaces of Messrs. Heath are situated close to the forges, mills, and collieries of the firm, and the gases from the furnaces raise steam for these. Therefore, Mr. Dempster had to keep in mind that these gases were valuable, and that he must use every economy in reference to them. The gases are conveyed first to the ammonia still, and the flues of this still are made three times the size of the other pipes, Mr. Dempster's object being to cause the gases to flow slowly round the still, and, by reducing the speed, to allow the dust to fall to the bottom of the flue, where, by an arrangement of scrapers, he collects this in a well at the end of the still. The well can be shut off from the flue by dampers, and the dust removed without having to stop working the still. The temperature of the gases being much higher than boiling point, the NH_3 from the liquor is driven off without any expense for fuel. The still is 40 feet long and 7 feet diameter, and holds about twenty-four hours' make of liquor, and the ammoniacal liquor is continually being pumped in, and, having baffle plates in the still, it flows on to the other end and out. As the still holds twenty-four hours' make of liquor, the liquor is twenty-four hours under the influence of the heat, and all the NH_3 is driven off. By an arrangement of valves the gases can be shut off from the flues of the still if required. The gases then flow on to what Mr. Dempster terms dust boxes, owing to their purpose being to arrest the remaining dust that

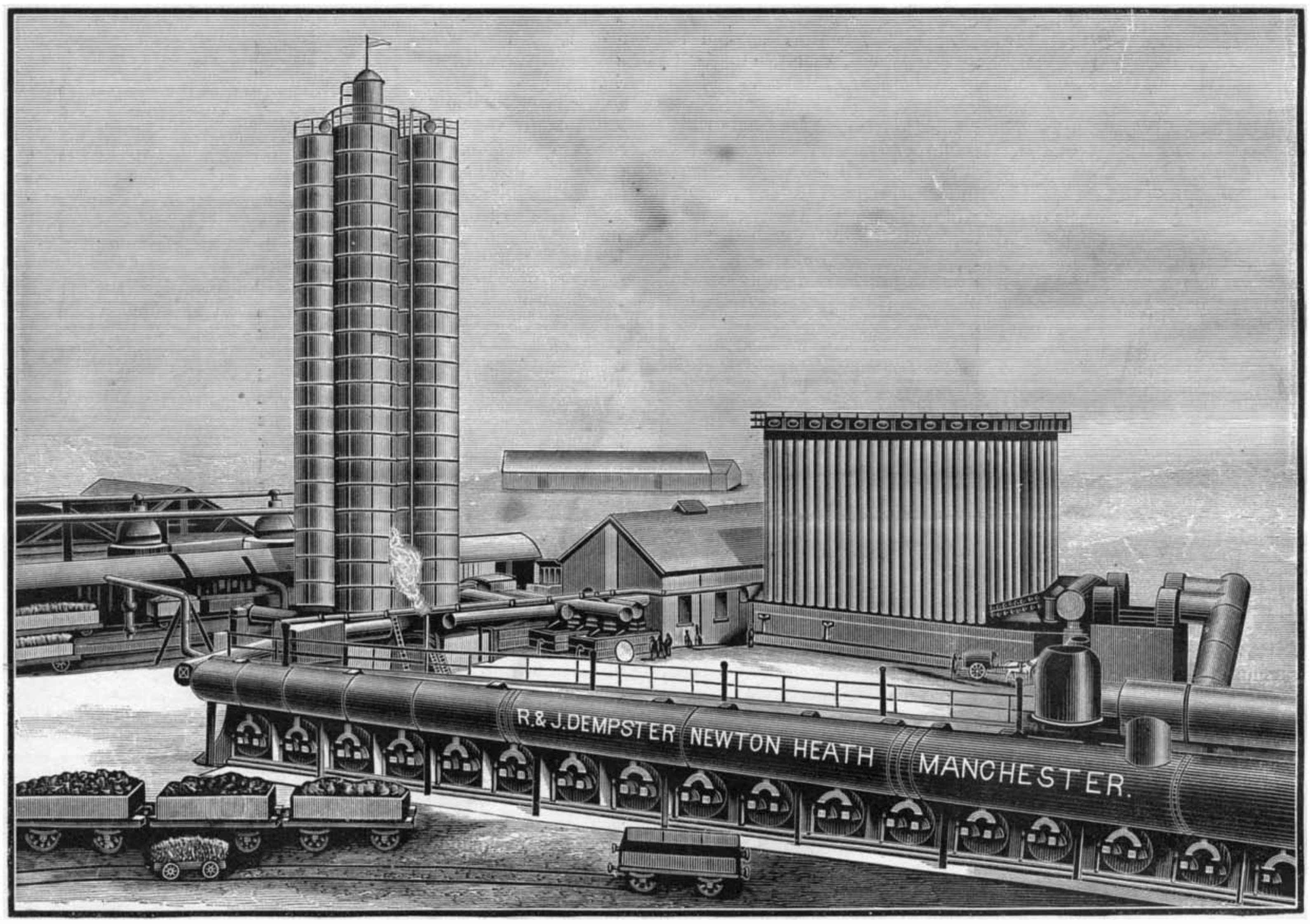

Fig. 1.—APPARATUS FOR THE RECOVERY OF TAR AND AMMONIA FROM BLAST FURNACES.