M. PALACIO'S DESIGN FOR A COLOSSAL MONUMENT IN MEMORY OF CHRISTOPHER COLUMBUS.

The construction of the Eiffel tower has awakened the pride of the nations. It is said that North America proposes to construct an iron tower which shall be higher than the one in Paris. England also desires to have a monumental tower.

When North America proposed a competition for the construction of a tower to be erected at the Universal Exposition of 1892, a Spanish architect, a native of Bilboa, Mr. M. Alberto de Palacio, drew an original design, of which we publish an engraving.

Mr. De Palacio has conceived a most perfect form, the sphere, which could not have been used prior to the knowledge of iron as a building material, because only by the modern methods of uniting the various parts, of which this material is susceptible, could a sphere be produced with a diameter of nearly 1,000 feet, that is, equal to the height of the Eiffel tower. This idea symbolizes the geographical completion of the earth which was realized by Christopher Columbus' discovery of the New World.

The following is a description of the magnificent design: The colossal sphere is mounted on a base which is 262 feet high, and is crowned at its North Pole by the caravel which carried Columbus to the New World. The monument is brilliant with the colors of the continents, oceans and islands of the terrestrial sphere.

The sphere will be encircled at the equator by a platform 3 280 feet, or more than half a mile, long. An exterior spiral running around the northern hemisphere will form a track nearly two miles long, leading from the equator to the North Pole. At night the sphere will be illuminated by the lines of light which will form the outlines of the continents and islands, thus casting over the city torrents of refulgent brilliancy. The great pyramids of Egypt, the Sphinx, and the Colossus could lie in the hollow interior like jewels in their case. So much for the exterior aspect.

An interior track runs around the southern hemisphere from the South Pole to the Equator, where it joins the exterior spiral. The total length of the spiral is nearly four miles, over which the sightseer can travel on a tramway.

In the base and under the majestic central rotunda will be placed a gigantic statue of the great discoverer surrounded by the navigators and missionaries who rendered his discovery fruitful. In the semicircle around this Olympus of heroes, inclosing the amphitheater, will be allegorical statues representing all the Spanish nations.

In the remaining spaces of the compartments in the base a large Columbus library will be distributed; auditorium for the cultivation of the natural sciences, museums of zoology, mineralogy, and botany of America, rooms for the Spanish Geographical Society, a great naval museum in the interior central compartment, a meteorological observatory in the hull of the caravel. All this is independent of the promenades, cafes, and restaurants for the public.

In the interior the celestial sphere can be exactly reproduced. It can also be used for magnificent panoramas, because the spherical form is the best for obtaining illusions of perspective. There will be a place for public entertainments.

This astonishing monument can serve as a perennial remembrance of the first Spanish-American and Colonial Exposition.

Mr. Palacio secures the stability of this immense mass by means of a simple method similar to that used for equestrian statues, so that the sphere will be able to resist winds of greater force than a cyclone.

From a business point of view Mr. Palacio makes the following calculation:

One hundred thousand spectators paying an entrance fee of $1, will bring $100,000. This will replace the capital in 62 days, without counting the profits of the cafes, entertainments, etc. The estimated total cost is $6,000,000.

INDISPENSABLE DATA FOR THE ESTIMATE.

Diameter of the sphere	984 ft.
Elevation of the sphere above the ground	262 "
Total height of the monument	1,312 "
Surface of the sphere	337,989 sq. yd.
Volume	18,492,341 " "
Length of the equatorial platform	3,280 ft.
Length of the ascending spiral	19,684 "
Total pressure of the wind of a hurricane against the monument	42,390,000 lbs.

ESTIMATE.

Cost of the sphere and its base	$5,059,200
Cost of the machinery, elevators and other accessories	$1,240,000

The architect, Mr. Palacio, is the designer of the movable bridge at Bilboa, used in connection with the submarine railway of Orton on the coast of Spain.—*La Ilustracion Española y Americana.*

IF a box six feet deep were filled with sea water and allowed to evaporate under the sun, there would be two inches of salt on the bottom. Taking the average depth of the ocean to be three miles, there would be a layer of pure salt 230 ft. thick on the bed of the Atlantic.

Prepared Sea Water for Marine Boilers.

Some interesting practical tests have recently been made at Southampton with an apparatus for the chemical preparation of sea water for marine boilers, suggested by Prof. Vivian B. Lewes, of the Royal Naval College, after many laboratory experiments and analyses of water. So far as the chemistry is concerned, it may be, says *Engineering*, thus briefly described: In order to separate the whole of the calcium and magnesium salts it is only necessary to raise the sea water to the boiling point with a proper quantity of sodic carbonate. This would convert the calcic sulphate into calcic carbonate, sodic sulphate, a soluble salt, being at the same time formed, while calcic carbonate precipitates as a soft powder, there being no calcic sulphate to harden it. The magnesium salts are thrown down as carbonates and a bulky precipitate, which must soon be removed, is thus formed. After this removal only the sodic chloride and sodic sulphate will remain, both so soluble that there will be no fear of anything depositing unless the evaporation were carried to the very improbable density of 1·2. The importance of the subject may be judged from the fact that one ton of water is required per twenty-four hours per 1,000 indicated horse power.

Prof. Lewes having perfected his process as far as was possible on a laboratory scale, Mr. J. H. Biles, the general manager of the naval construction works at Southampton, placed a crane boiler in the works at his disposal in order to try the practical effect of the process upon it, and after steaming continuously for a month with nothing but prepared sea water, the boiler was, on September 18, opened in the presence of a representative gathering of gentlemen interested in the subject, when the interior of the boiler was found to be in perfect order, no trace of incrustation or scale having been formed, the plates merely looking as if they had received the thinnest possible coating of lime white.

The feed water for the boiler was drawn from the river Itchen, a quarter of an hour before high tide each day, and on analysis proved to be practically pure sea water, but contained besides much organic matter, which under ordinary circumstances would have given an excessively deleterious form of deposit. This water having been stored in a large tank, was pumped a ton at a time into what Prof. Lewes terms the "precipitator," an egg-shaped vessel placed on end. Into this water exhaust steam was periodically blown until the boiling point was nearly reached, when a packet of "precipitator powder," already referred to, was added to the water through a small manhole in the top of the vessel. This, at once, threw down all the lime and magnesium salts present in the sea water, in the form of a white flocculent precipitate. The vessel was then closed, and steam blown in until a pressure of 10 lb. was reached, and under these conditions the precipitated constituents of the sea water rapidly settled, leaving the liquid only slightly turbid, and this turbidity was got rid of by running the prepared water through an asbestos filter into the hot well, from whence it was pumped into the boiler. The sea water so treated contained nothing but sodium salts, which, like common salt, are very soluble, and will not deposit until evaporated to a density of 1·2, a point never approached except by the grossest carelessness, being equal to over 7-32 on the salinometer.

The advantages claimed for the use of this prepared water are that, containing no lime salts, all incrustation is avoided, and the expense and wear to the boiler of scaling is done away with, while the removal of the magnesium salts present in the original sea water prevents the pitting and corrosion of the plates. Zinc protectors are rendered unnecessary, and no distilling boiler for water for make-up has to be carried. As regards expense, it is claimed to compare favorably with all other processes, being about one-fourth that of distilled water, and less even than the ordinary fresh water supplied at many ports.

The density of the prepared water is less than the density of salt water, and as it is possible to evaporate it to a greater extent, the loss of heat by blowing off is very small. The exhaust steam used for heating the sea water is all condensed and passes back with the prepared water to the hot well, and, being itself at the boiling point, all waste of heat is avoided, while the salts present in the water prevent any action on the metal, thus making it better to use than distilled water, the high solvent action of which upon metals makes it undesirable in boilers.

The opinion was freely expressed that if the process gave anything like the results at high pressures that it had done at moderate ones, it was destined to play an important part in the boiler practice of the future.

The Prevention of Phthisis.

The announcement, almost simultaneously, of two methods of preventing the development of tuberculosis has apparently made very little stir in the medical world. The medical world, in fact, is getting apathetic on the subject of cures for phthisis. Still the present claims come from the two chief bacteriological laboratories of Germany and France respectively, and are put forth by Dr. R. Koch and by Dr. Grancher, both of whom are men to be trusted. Dr. Koch asserts, as we understand him, that he has found a chemical substance which, when given to animals, prevents the development of tuberculosis in them. Dr. Grancher has obtained by cultivation a fluid with which he vaccinates animals and thereby prevents also the subsequent development of tuberculosis.—*Med. Record.*

Metallurgy in the Southern States.

Now that the members of the British Iron and Steel Institute are holding high festival in the United States, it is interesting to recall the fact that the American Union has become the first iron-producing country in the world. This proud position was long held by Great Britain; but the rapid growth of American capital and population, the vast extent of the United States, and their abounding stores of natural wealth, have all told in favor of American metallurgical pre-eminence, which has now become an accomplished fact. We have omitted to notice one circumstance which has largely contributed to the change which has taken place. We refer to the great progress which metallurgical industry has made in the Southern States during the last ten years, and even during the last five years. By the Southern States we mean Alabama, Tennessee, Virginia, West Virginia, Kentucky, Georgia, Maryland, Texas, and North Carolina. These nine States produced between them 342,537 tons of iron in 1885. In 1886 the total was carried to 415,528 tons; in 1887, to 445,226 tons; in 1888, to 485,852 tons; in 1889, to 744,610 tons; and in 1890, to 961,966 tons. Each year closes it should be observed, for the purposes of the comparison, at June 30. It is this arrangement which enables 1890 to be brought into the calculation. The progress achieved in connection with Southern metallurgy is especially observable in Alabama, which made 463,451 tons of iron in 1890, as compared with 364,346 tons in 1889, 169,696 tons in 1888, 146,280 tons in 1887, and 118,186 tons in 1886.

So confident are Alabama iron men of the future industrial greatness of the State that some of them think that it will displace Pennsylvania, which has hitherto been regarded as the great American metallurgical State *par excellence*. But the production of iron in Pennsylvania in 1889–90 having been 2,546,501 tons, as compared with an output of 463,451 tons in Alabama, it is clear that Pennsylvania will still take a great deal of beating.

Another important Southern metallurgical State is Tennessee, which attained an output of 143,693 tons in 1889–90, as compared with a production of 79,144 tons in 1884–85. The production of Virginia had also increased to 166,461 tons in 1889–90 as compared with 74,627 tons in 1884–85. On all sides Southern metallurgy is making progress, although only just a beginning has been made at present in Texas and North Carolina. As a result of the great advance which American metallurgy has been making during the last five years, the importation of foreign iron and steel into the United States has very sensibly declined. In the first half of 1887 these imports amounted to 960,649 tons, in the first half of 1888, to 472,089 tons, in the first half of 1889, to 404,591 tons, and in the first half of 1890, to 314,969 tons. Great as the consumptive powers of the Americans undoubtedly are, the enormous strides which have been made in the production of native iron have had the effect of squeezing foreign iron and steel more and more on one side since 1885, and there appears a prospect of its finally being got rid of altogether, except as regards small quantities of special descriptions which enjoy a practical monopoly.

The basis of the metallurgical industry of any country is the quantity of pig which it makes; and in this respect the Americans have been making marvelous advances every year since 1886. In that year they made 2,954,209 tons of pig; in 1887, 3,415,210 tons; in 1888, 3,382,502 tons; in 1889, 4,100,995 tons; and in 1890—that is, in the twelve months ending June 30, 1890—5,109,737 tons. The production has thus almost doubled itself during the last five years; and, notwithstanding this extraordinary result, there have been no important accumulations of stocks. Upon the whole, everything appears to show that American metallurgical progress rests upon a solid and substantial foundation. It is one thing for a country to produce so much pig, or so much iron, and another thing to dispose of it; but the Americans appear to have accomplished both results, and they may look accordingly with confidence to the course of events in the future. Many circumstances, of course, tell in favor of American metallurgy besides those at which we have already glanced. In the first place, the cheaper rates of interest now ruling in the United States are calculated to encourage enterprise of all kinds, and especially railroad enterprise; in the second place, there is not likely to be so much difficulty in future in regard to supplies of labor; and, in the third place, the extension of railroads in the Southern States not only supports the demand for railroad iron, but also facilitates the delivery of metallurgical products of all kinds to remote and formerly inaccessible districts.—*London Engineering.*