

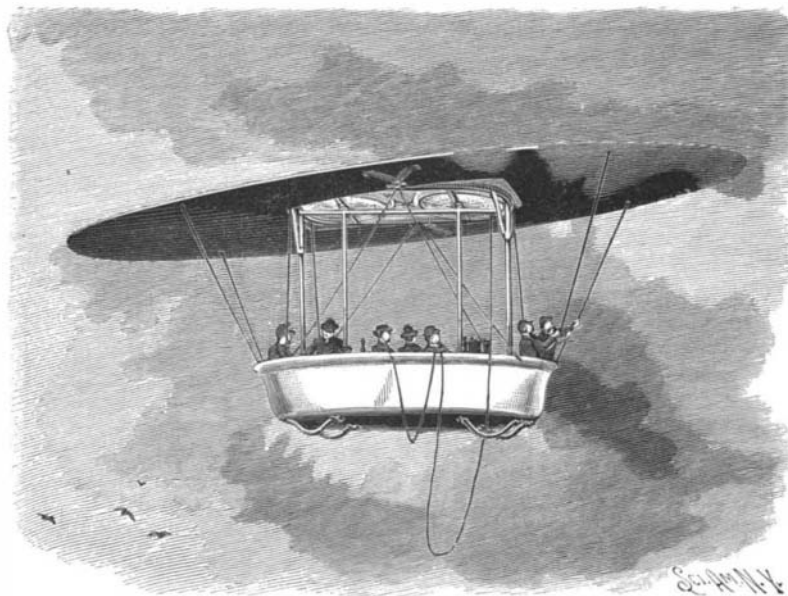
AERIAL NAVIGATION.

Among the many efforts constantly being made to construct a vessel which will be able to travel and carry passengers through the air, those which depend largely upon the use of the aeroplane for their support in motion, and for making use of the air currents to the best advantage, seem to have of late attracted the most attention. An air vessel of this class is shown in the accompanying illustration, and forms the subject of a patent recently issued to Estanislao Caballero de los Olivos, No. 34 West Fifteenth Street, New York City. In a suitable light, but strongly made, basket or car is carried the best obtainable type of engine for operating sustaining screws on the upper ends of shafts journaled in a light framework, to which is pivoted an elongated ring surrounding the screws. To the latter ring is pivoted, in a manner to form a universal joint, an aeroplane, which may be inclined in any direction relative to the sustaining screws, and held adjusted in the position desired, by means of ropes or equivalent means, the aeroplane having a central opening of sufficient size to allow it to be so inclined without impinging upon the framework or the screws. The ascent and descent of the vessel are designed to be controlled by the operation of the screws, and when the aeroplane is set at an inclination to the plane of the screws, the reaction of the air striking the inclined surface causes a forward movement in the direction of the highest point of the aeroplane if the vessel is ascending, and in the opposite direction if the vessel is descending, the direction being changed or reversed without altering the speed of the engine or the position of the screws. On the bottom of the car are springs to prevent undue shock or jar when it comes down to the ground.

THE INTERNATIONAL EXPOSITION AT ATLANTA.

The fact that the South and its wonderful agricultural, mineral, and manufacturing resources were not adequately represented at the World's Columbian Exposition led to the inception of this enterprise, which

has the further object of fostering the trade relations already existing between the Southern States and the republics of Mexico and Central and South America; also the promotion of commercial intercourse between the Southern States and the ports of Europe. Atlanta was selected as the site of the Exposition, which will open on September 15 and close on December 31, 1895.

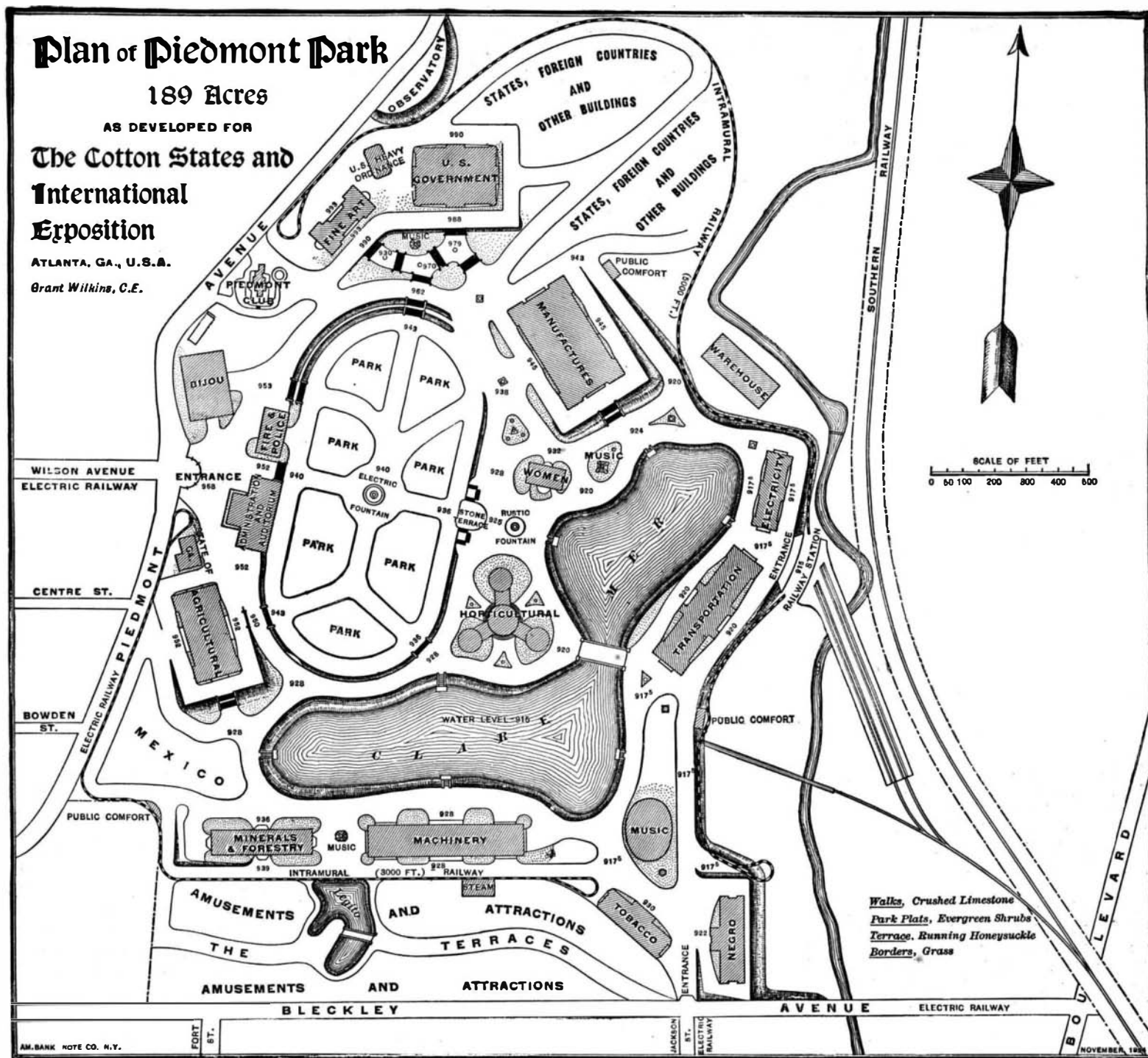


CABALLERO'S AIR VESSEL.

The Exposition will be held in Piedmont Park, located two miles from the center of the city of Atlanta. This park contains 189 acres, and more than \$300,000 has already been expended in heightening the picturesque features of the landscape, and about \$2,000,000 in all will be expended to make the Fair. We present herewith a copy of the official plan of the Exposition grounds. The small numbers on the plan show the elevation above the sea level, so that a fair idea of the topography can be obtained. This hilly ground adds greatly to the beauty of the park. It has been much commented upon, and the Chief of Construction, who is also the Landscape Engineer, has

taken advantage of it to produce the amphitheater effect around the plaza or park as it is called, the center of which corresponds with the arena. Inland lakes have been constructed, and with few exceptions, the buildings will have a water frontage. On these lakes, electric launches and gondolas will ply, affording an agreeable mode of transit from one part of the grounds to another.

The Exposition has received the indorsement of the United States government, Congress having appropriated \$200,000 for the Government building and exhibit. The Exposition has also received the indorsement of the legislatures and principal commercial bodies of a number of States, and many of them will be represented by State buildings and exhibits. Through the State Department of the United States, invitations were sent to all foreign countries of importance, and a number have accepted, so that, besides the exhibits from the Southern republics, the management is assured of exhibits from almost every important country in Europe. In addition to the United States Government building, there are twelve principal structures. The following is the list: The Manufactures and Liberal Arts, Fine Arts, Agriculture, Auditorium, Administration, Fire, Machinery, Minerals and Forestry, Negro, Transportation, Electricity, and Woman's. The leading idea is Romanesque, and the buildings are designed with an idea of stability and simplicity in construction, and the architectural effect will be produced by outlines and proportion rather than by detail and tawdry ornamentation. Mr. Bradford L. Gilbert, of New York, is the supervising architect, and is the designer of ten buildings. Mr. Walter T. Downing, of Atlanta, furnished the design for the Fine Arts building, and Miss Elise Mercur, of Pittsburg, the design for the Woman's building. The dimensions of the buildings are as follows: Manufactures and Liberal Arts, 356 feet long, 206 feet wide and 90 feet high; Machinery, 500 feet long, 118 feet wide and 60 feet high; Minerals and Forestry, 350 feet long, 110 feet wide and 50 feet high to center of the



THE ATLANTA COTTON EXPOSITION—GROUNDS AND BUILDINGS.

dome; Agriculture, 304 feet long, 150 feet wide and 110 feet high to center of the dome; Electricity, 262 feet long, 85 feet wide and 109 feet to the center of the dome; Transportation, 450 feet long, 150 feet wide and 68 feet high, the two end galleries 48 by 117 feet; Negro building, 276 feet long, 112 feet wide and 70 feet high; Administration building, combining main entrance, fronting 240 feet on Piedmont Avenue, 50 feet wide at center and 3 stories high; Auditorium, including police department and express office, 200 feet long, 135 feet deep and 4 stories high, with mezzanine stories; Fire building, 205 feet long, 50 feet wide, 2 stories high; Woman's building, 150 feet long, 128 feet deep and 90 feet to the top of the statue on the central dome; Fine Arts, 245 feet long, 110 feet wide and 50 feet high. Several of the States will have buildings of their own. A succession of attractive musical programmes is being arranged for. A chime of bells, the largest ever exhibited in America, will be erected on a tower 150 feet high near the Government building.

As in both the Columbian Exposition and the California Midwinter Fair, the amusement features have not been neglected. The terraces between Piedmont Avenue and Jackson Street will be devoted to them. The street curves along a slope with a continuous succession of picturesque structures, the adobe houses and bamboo huts of the Mexican and Guatemalan villages and the wigwams of the Indian are in striking contrast with the antique designs of the oriental village and the quaint and curious architecture of the Japanese and Esquimaux, the German and the Chinese villages. Prominent among other structures will be Hagenbeck's arena of trained wild animals, the Vaudeville Theater, the Palace of Illusion, the Mystic Maze, and the Scenic Railway, while at the end of the street will be Buffalo Bill's Wild West Show.

The officers of the Exposition are Charles A. Collier, president and director general; Walter G. Cooper, chief of the department of publicity and promotion; Grant Wilkins, chief of construction and landscape engineer. Atlanta is a city of 110,000 people, and the committee in charge of public comfort, after careful consideration, have decided to adopt the system which was operated with success at Philadelphia during the Centennial. The control of this business will be held by the Exposition company, and all of the available rooms in hotels, boarding houses and private residences will be registered. The same work will be carried on through the outlying towns, so that this will materially expand Atlanta's capacity for accommodating visitors. This information will be tabulated and sent broadcast over the country, and visitors from a distance will be encouraged to engage quarters in advance. In short the public comfort bureau will run the city very much as a hotel is run, and bicycle messengers will take the place of bell boys.

Paper Sails.

An innovation in yachting circles is now being talked of, nothing less than sails made of compressed paper, the sheets being cemented and riveted together in such a way as to form a smooth and strong seam. It appears that the first process of manufacturing consists in preparing the pulp in the regular way, to a ton of which is added 1 pound of bichromate of potash, 25 pounds of glue, 32 pounds of alum, $1\frac{1}{2}$ pounds of soluble glass, and 40 pounds of prime tallow, these ingredients being thoroughly mixed with the pulp. Next the pulp is made into sheets by regular paper-making machinery, and two sheets are pressed together with a glutinous compound between, so as to retain the pieces firmly, making the whole practically homogeneous.

The next operation is quite important, and requires a specially built machine of great power, which is used in compressing the paper from a thick, sticky sheet to a very thin, tough one. The now solid sheet is run through a bath of sulphuric acid, to which ten per cent of distilled water has been added, from which it emerges to pass between glass rollers, then through a bath of ammonia, then clear water, and finally through felt rollers, after which it is dried and polished between heated metal cylinders. The paper resulting from this process is in sheets of ordinary width and thickness of cotton duck; it is elastic, airtight, durable, light, and possessed of other needed qualifications to make it available for light sailmaking.

The mode of putting the sheets together is by having a split on the edges of the sheet, or cloth, so as to admit the edge of the other sheet. When the split is closed, cemented and riveted or sewed, it closes completely and firmly.—Marine Record.

HOLLAND disfranchises a citizen if he is absent from the country for ten years and during that time does not formally notify the proper authority that he wishes to continue to be regarded as a citizen.

Great Britain does not so easily give up her claim to the loyalty of her subjects. A man may count upon her protection on the ground that his grandfather was by birth and allegiance an Englishman, even though he and his father were both born and have always lived on foreign soil, but without being naturalized.

How is Vulcanization Accomplished?

The chemical nature of caoutchouc is but little better known to-day than it was sixty years ago, when the products of its dry distillation were examined by Gregory. Recent study has shown that chief among these derivatives of caoutchouc is a liquid called isoprene, which has the important property of spontaneously changing into rubber, on long standing. Artificial rubber is thus a chemical possibility. Whether we shall succeed in making it commercially from isoprene, seems very doubtful. The manufacture of cheap isoprene is an exceedingly difficult task and we are not yet able to completely convert it into rubber. Chemically caoutchouc or pure rubber is an "unsaturated" hydrocarbon; or in other words a compound of hydrogen and carbon possessing the chemical property of directly combining with other compounds and elements.

The chemical treatment of rubber in its manufacture is limited to vulcanization—the change effected by subjecting it to the action of sulphur at temperatures above the melting point of the latter or to solutions of chloride of sulphur in the cold.

The chemistry of vulcanization has never been thoroughly investigated or satisfactorily explained. It is often spoken of as due to the "absorption" of sulphur by the rubber or its formation of a "substitution product" with sulphur. These terms express in a conveniently vague way the uncertain chemical theories regarding what actually takes place in the curing of rubber. It is fair to conclude that neither the vulcanization with sulphur nor that by chloride of sulphur is in the least understood. Even such a simple question as that regarding the minimum quantity of sulphur required for vulcanization or the equally simple one whether the vulcanizing action of chloride of sulphur is due to the sulphur or the chlorine, are still objects of controversy. It is, however, agreed that vulcanization cannot be effected by less than two per cent of sulphur.

In investigating the chemistry of vulcanization the author worked with the cold cure process because it effects vulcanization under conditions more easily under control than is the case with sulphur and heat. Rubber vulcanized by chloride of sulphur forms an addition product, the two substances uniting into a definite compound. Isolating this compound, the author was able by suitable means to entirely remove from it the combined chlorine, leaving the vulcanization product intact and physically unchanged. Any attempt to remove the sulphur from its combination with the rubber is unsuccessful and results in the total destruction of the substance, thus proving that the vulcanization is entirely due to the action of the sulphur and not at all to the chlorine.

Rubber will combine with its weight of chloride of sulphur, forming a product containing twenty-three per cent of sulphur. This is the highest vulcanization product (i. e., containing highest per cent of combined sulphur) that rubber is capable of forming. On the other hand, the lowest vulcanization product contains five per cent of combined sulphur. This is a homogeneous body and contains no uncombined rubber. It is not simply a mixture, in unaltered rubber, of a rubber sulpho-chloride. Between these products are eight other sulpho-chlorides of rubber, the whole forming a series containing from one to ten atoms of combined sulphur. The great difference in the physical properties of the end members of the series indicates that each of these ten varieties of vulcanite will have distinct properties to distinguish it. It is a matter of great practical importance to define clearly the specific qualities of each of these products. The vulcanization of rubber, by chloride of sulphur, consists in the formation of one or more of these sulpho-chlorides of rubber. The presence of chlorine is without influence on the state of vulcanization; it is merely the means in the chloride of sulphur which enables us to act on the rubber with a double atom of sulphur in an effective way.

The present process of vulcanization with chloride of sulphur does not admit of homogeneous vulcanization. A practical process based on the reaction between rubber and chloride of sulphur will ultimately displace the processes now in use for curing all kinds of rubber articles. The present sulphur cure is an exceedingly crude, unreliable, antiquated and unscientific process kept alive by our ignorance of the chemistry of rubber. The process is essentially in the stage to which the work of Goodyear, Hancock and Parkes advanced it.

In the original paper Mr. Weber gives in detail the tests and analyses which support his conclusions regarding the chemical theory of vulcanization. He has dealt very ably with the purely scientific aspects of the problem and promises something in the future on the practical questions involved in a new method.

While the actual difficulties are many and great, they are not believed to be insuperable. Certainly there is more need to-day than ever for some improvements in vulcanization methods capable of giving such

* Abstract of paper by O. C. Weber in the Journal of the Society of Chemical Industry. Prepared for the India Rubber World.

complete control of the process that any one of the above named series of ten vulcanization products can be obtained at will; or any desired combination of them, as circumstances may require.

To Prevent Drifting Sands.

Some years ago the Federal government expended \$60,000 in planting beach grass along the ocean side of the tip of Cape Cod, in an effort to prevent that drifting inward of the beach sands which threatens Provincetown with entire destruction. But the work was undertaken upon too small a scale, and the inhabitants of the town did not realize that the growth of the grass would have to be fostered, so that most of it has perished and the advance of the sand drifts continues. The State of Massachusetts has, however, now taken the matter in hand, through its harbor and land commission, and Mr. Leonard W. Ross, of Boston, has been retained as advisory forester. Mr. Ross proposes to adopt expedients similar to those successfully begun more than a hundred years ago to save lands on the shore of the Bay of Biscay; and expense will not be spared, for the harbor of Provincetown is the only one that affords shelter to mariners along many leagues of stormy coast. His method will be based upon that by which Nature herself once defended the point of the promontory. Her thick plantations of beach grass were backed by low forests of pitch pine, which were cut off for fuel by the early settlers. These will be renewed, and, according to the Boston Transcript, a nursery has been already established for the propagation of the Scotch broom, *Genista scoparia*, which, with silver poplars, white willows and locusts, and an undergrowth of smaller plants, will be used to form windbreaks. Austrian and Scotch pines will be tried, and also the maritime pine, the alder, the European white birch, the hornbeam, the cockspur thorn, and the tamarix.

Do Gulls Follow Ships?

On a late trip of one of the steamers plying between Portland and San Francisco the question came up among the passengers as to whether the gulls which appeared around the ship each morning were the same birds as had been with the ship on the day previous. To test the matter a line and fish hook were procured, and with a bait of salt pork the fishing for a sea gull was commenced. The first cast of the line was successful, a big gray bird swooping down on the bait. He was hauled aboard and found to be uninjured, the hook having caught in one of the glands of the beak, from which it was readily loosened. After detaching the hook a strip of red flannel was brought and carefully tied around the gull's left leg by one of the seamen of the steamer, the bird being then turned loose. Circling for a moment in the air, the gull started toward the distant blue streak which denoted the coast line, and it was generally allowed that each day brought a new contingent of gulls to follow the steamer and pick up the waste scraps from the table; but on coming on deck after breakfast the next morning there was the flannel-bedecked gull to be seen, the most clamorous of all the birds. To test the gull's reasoning power, if it had any, the same line and bait was drifted astern, the gull caught the day before being one of the first to strike for it.

Remarkable Lakes in British Columbia.

Little Shuswap Lake is stated to have a flat bottom, with a depth varying from 58 to 74 feet, measured from the mean high water mark. The deepest water found in the Great Shuswap was 555 feet, about six miles northward from Cinnemousun Narrows, in Seymour Arm, though the whole lake is notably deep. Adams Lake, however, exceeds either of the Shuswaps, as its average depth for twenty miles is upward of 1,100 feet, and at one point a depth of 1,900 feet was recorded. In the northwest corner of this lake, at a depth of 1,118 feet, the purpose of the scientific explorers was defeated by the presence of mysterious submarine currents, which played with the sounding line like some giant fish and prevented any measurement being taken. It is a complete mystery how the currents could have been created at this depth, and scientific curiosity will no doubt impel either public or private enterprise to send a second expedition to the scene this summer to endeavor to solve the riddle. As the height of the surface of this lake is 1,380 feet above the sea level, its present bed is, therefore, only 190 feet above the sea, although distant 200 miles from the nearest part of the ocean. Dr. Dawson and his associates believe that the beds of some of the mountain lakes in the region are many feet lower than the sea level.—Vancouver World.

PHOTOGRAPHS OF THE HARLEM SHIP CANAL—A CORRECTION.—In our issue of June 29, 1895, we should have stated that our illustrations of the opening of the Harlem Ship Canal were made from photographs by Mr. E. Muller, of Brooklyn, New York. The pictures speak for themselves, and show Mr. Muller to be a superior photographer in this line of work.