NEW FRENCH AEROPLANES.

Santos Dumont, Capt. Ferber, and several other French experimenters have been hard at work during the past winter building new aeroplanes with which to compete for the many prizes now offered. The illustrations published herewith show two of the new aeroplanes—those of Santos Dumont and M. Delagrange. The former aeroplane was described briefly in a recent issue of the Scientific American. As can be seen from the photograph, the long beam, which projected in front of his former aeroplane and carried the box-shaped rudder, is now placed at the rear of the planes. The motor is placed high in the middle of the structure, and carries a 66-inch propeller upon its crankshaft, while the operator sits upon a small saddle below and in front of the motor. The new aeroplane is to have a 100-horse-power, 16-cylinder, water-cooled engine, which will weigh with its accessories about 260 pounds, or 73 pounds more than the 50-horse-power motor.

The weight of the machine itself is some 66 pounds less than the weight of Santos Dumont's former machine, which weighed complete, with a 50-horse-power motor, about 460 pounds. The new machine, equipped with a 50-horse-power, 8-cylinder motor as shown in the illustrations, weighs just under 400 pounds, or, with M. Dumont on board, a little over 500. The planes are 36½ feet long by about 2 feet wide, which gives a total supporting surface of about 146 square feet. The load carried per square foot will be from 3 to 3½ pounds, which is rather high and will accordingly make necessary a speed of over 50 miles an hour before the machine will lift. The chief novelty in the construction of the new aeroplane is the use of mahogany instead of bamboo rods. The horizontal surfaces are constructed of thin wood strips in place of the canvas used heretofore, while the vertical divisions are still made of cloth.

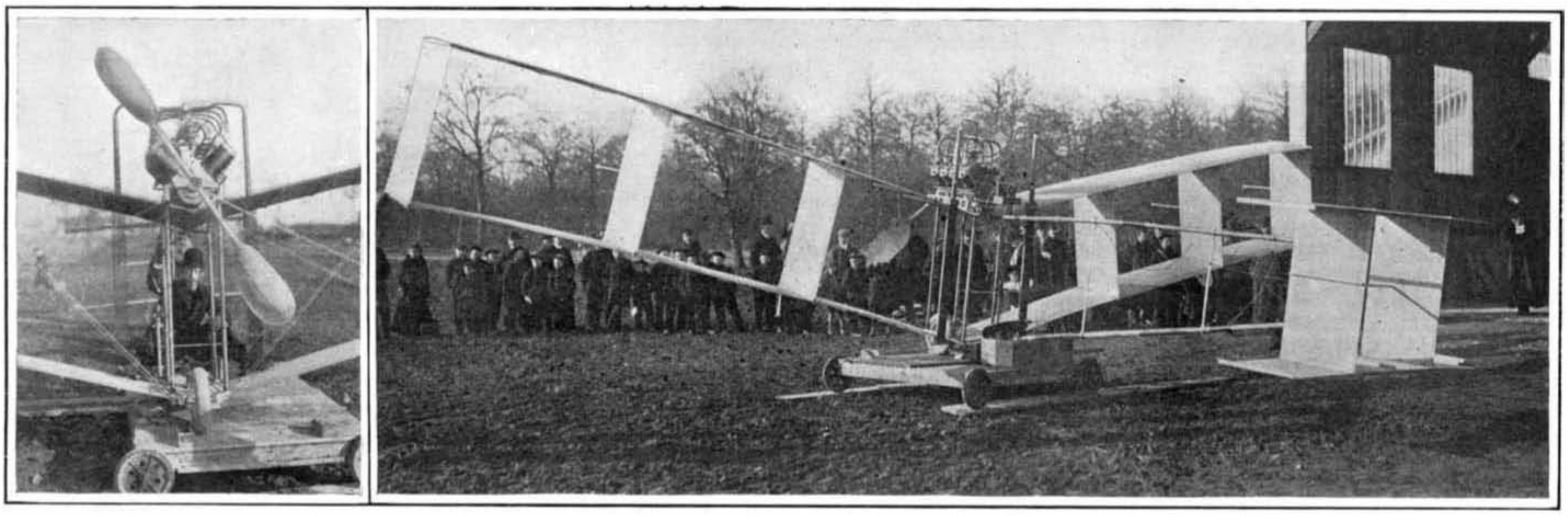
The Delagrange aeroplane, which we also illustrate, had its first test on February 28 at Vincennes. This apparatus is of the cellular type, and has 60 square meters of surface. It is a double-surface machine of the biplane type, the second set of planes being only about half the length of the first. The main aeroplanes are 32.8 x 6½ feet in length and width, while the rear planes are only half as long and have the same width. The main planes are 4.9 feet apart. They are connected together by vertical posts braced with steel wire. The material used is light varnished cloth, which is stretched over curved wooden ribs in the usual manner. The rear planes are connected together by three vertical planes, which are intended to assure the stability of the machine and to keep it moving forward in a straight line. Back of the middle one of these planes is placed the rudder, which is suitably connected to the steering gear arranged beside the operator. The rear planes are carried on a small pneumatic-tired wheel, which can be turned in any direction, while the front planes are mounted upon a framework of steel tubing supported upon two wheels through the intermedium of shock-absorbing springs. The front and rear planes are connected together by steel tubes and are braced with wire.

In the middle of the forward planes, on a suitable bed, is placed the motor, a seat for the operator, the steering and control levers, and, on the end of a long beam some 9 feet forward, the horizontal rudder, which is also made up of two planes having a total surface of 7 square meters (75.34 square feet).

At the rear part of this bed is placed an 8-cylinder motor of 50 horse-power, which makes 1,500 R.P.M. The propeller is fastened upon the motor shaft, and has a diameter of 2.1 meters (6.89 feet) and a 1-meter (3.28 foot) pitch. The blades are of cast aluminium, and are riveted to the arms of steel tubing which screw into a steel hub. This propeller is so constructed that all its parts produce traction except the central part about the hub, which undergoes merely a bending strain. It develops a thrust of 150 kilogrammes (330 pounds) when the motor is turning up 1,400 R. P. M. and developing 40 horse-power.

From previous experiments of M. Voisin (the constructor) with this type of aeroplane mounted on floats and drawn by a motor boat, this gentleman has figured that the present aeroplane (which has 645.84 square feet of supporting surface) should lift at a speed of about 52 miles an hour. From the former experiments also, an aeroplane of this type was found to be quite stable.

At the first trial of the new aeroplane on the drill grounds at Vincennes, the machine was put together amid a crowd of curious spectators. When everything was ready, M. Voisin took his seat, and the 50-horse-power, 8-cylinder, V motor was started. The machine shot forward some 150 feet, and then the front part started suddenly skyward as shown in the photograph, and the tubes connecting the front and rear planes were bent. It is claimed the accident was due to improper assembling when the machine was put together on the site of the test. M. Delagrange, its sculptor inventor, will have it reconstructed and then make further trials.



Front and Rear Views of Santos Dumont's New Aeroplane in Which Thin Wood Sheets Form the Supporting Surfaces.

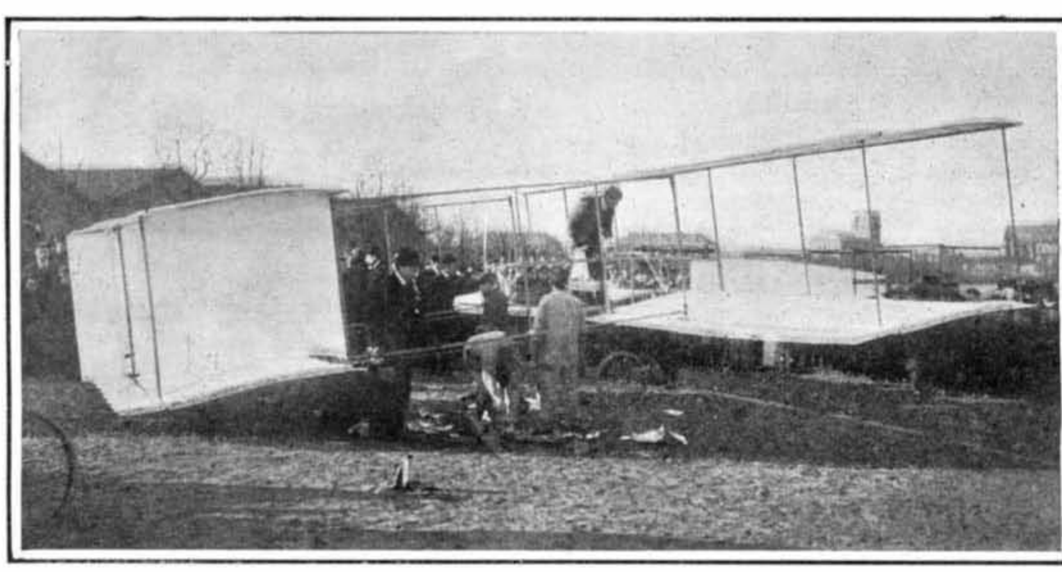
Note the peculiar propeller with spoon-shaped blades which pulls the machine along on its single wheel; also the placing of the combined horizontal and vertical rudders at the rear instead of in front, and the mounting of the motor on top of the planes.

Motoring in the Desert.

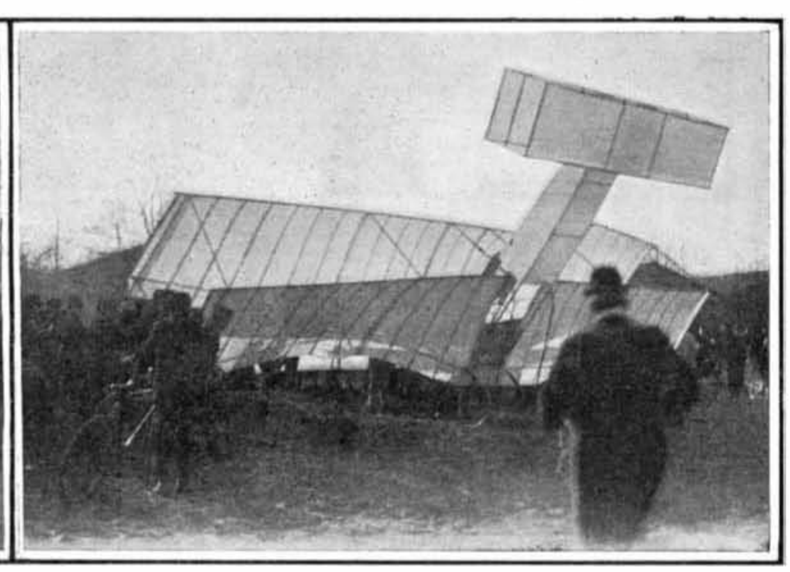
Motor cars are now taking the camel's place for travel in the Eastern Desert. They are found to be a less difficult means of conveyance, as well as a more economical one. Cairo, Egypt, has four times as many automobiles this year as last, and the number is rapidly increasing. As there are no hills to climb, the cheaper machines of small horse-power are most generally used. The mining department of the ministry of finance is constructing roads for police service in the Eastern Desert, and the progress has been considerable. An excellent track of ninety miles has been completed between Edfou and Beza. From Beza it will branch to the north and south.

The department of mines has had a new type of motor built for use in the desert, which has proved very satisfactory. The longest day's trip in the Eastern Desert was 148 miles, which was made last summer. During the last trip made by the mining department's tricar, 243 miles were covered in four days, during which time the ordinary work of inspecting the roads and mines was carried on. Three-wheel motor cars are more successful for desert travel than motor cycles, which cause a great strain on the rider. Ordinary pneumatic tires are used, protected by leather and iron-studded bands. Water is only necessary at 50-mile intervals.

The Port Said Motor Car Company started service recently, running to the Arab village. Each car accommodates 25 passengers, and the trip is made in less than half the time taken by the trams. The economy of motoring in the desert is shown in the detail of the work accomplished by the two tricars and the motor cycle during their desert journeys. The six-horse-power tricar covered a total mileage of 2,280, averaging 25 miles per gallon of petroleum; average lubricant, 1.6 pint per 100 miles. The nine-horse-power tricar covered a total mileage of 1,051; averaged 25.8 miles per gallon petroleum and 2.4 pints lubricant. Motor cycle, mileage, 1,462; 63.8 miles per gallon petroleum, and the average lubricant per 100 miles, 0.35 pint.



Side View of Delagrange Aeroplane Ready for Its Trial.



The Broken Front Planes Turned Upward After the Test.

This machine is of the bi-plane or following surface type, there being two sets of double surfaces, one behind the other. The motor is mounted on the lower forward plane, the propeller being on the motor crankshaft just back of the plane and the operator's seat being placed in front of the motor. The rear planes are connected by three vertical partitions, with a small vertical rudder behind the middle one. A double horizontal rudder is fitted in front.

TWO OF THE LATEST FRENCH AEROPLANES.

Report of Tests of Steels by the Mechanical Branch of the Association of Licensed Automobile Manufacturers.

The Mechanical Branch of the Association of Licensed Automobile Manufacturers has just issued to its members a report on materials which have been tested and experimented upon at the Hartford laboratory for the past year, also the complete specifications for various kinds of steel which have been found to be most desirable for specific parts of automobile construction. During the year scores of samples of special steel of unusually high grade have been tested. They were tested in the natural condition, as received from the steel works, tested annealed for heat treatment, and tested to ascertain the toughest possible condition combined with strength. Some of the steels experimented with were silicon and manganese with chromium, vanadium, silico-manganese, chrome nickel, and nickel.

Vanadium, which is just becoming known to some manufacturers, has been under experiment for nearly a year at the Hartford laboratory. Many of the members of the Association of Licensed Automobile Manufacturers have been using vanadium steels for over a year, but only since the elaborate tests which have been made by the Association's metallurgical force has the recommendation and adoption been universal with the Association members. The results of the experiments have proven the desirability of vanadium steels for special parts of automobile construction. It is a most elusive element and its introduction to the basic material must be carefully made. It seems to act as a cleanser if judiciously used, and eliminates many elements which otherwise would be a detriment to the steel. J. Kent Smith, the English metallurgist and exponent of vanadium, in his address to the members of the Mechanical Branch, stated authoritatively that "vanadium steel was the finest steel for mechanically-moving machines." The elements of vanadium are to be found in many substances, but only in microscopic form. Swedish iron contains a small quantity of this valuable material. The presence of vanadium in steels has a tendency to add longer life, strength, and durability. It is easily welded, it is superior in rigidity, and extremely easy to machine. Its elastic limit under all conditions is extremely high as compared with the tensile strength, for use in gears, frames, axles, crankshafts, and propelling shafts. Vanadium steel is considered to be more serviceable than any other metal known.

Specifications for the treatment of metals for A. L. A. M. screw material, cylinder iron, steel castings, and nickel castings were issued, with directions for obtaining the maximum results in their use.

The visit of the members of the Mechanical Branch, in a body, to the Bethlehem Steel Works, as the latter's guests, was accompanied by some interesting results. The Branch spent the entire day minutely inspecting the methods employed by the Bethlehem Steel Company in the manufacture of special grades of steel. The willingness of the large steel companies to co-operate with the Association in the manufacture of the highest grade of material is, in a measure, responsible for the superior grade of steel found in the licensed cars.

Thorough investigation by the test committee brought out the fact that not only was there considerable variance between the practice of various manufacturers in the use of taps and drills, but even the screw manufacturers were at variance in their own establishments. A standard drill size was suggested and adopted by the members of the Branch and the outside makers of drills and taps. The adoption of a uniform magneto base was thoroughly recommended, especially when it is known that many new magnetos are to be placed on the market. The tendency of the makers for their 1908 models will be the use of magnetos. These will have a standard base, so that option on magnetos can be given without reconstruction of base standards.

A new department of the Branch which will be a source of benefit to each engineer, and in fact to the whole engineering world, will be the Mechanical Branch Technical Library, under the directorship of Coker F. Clarkson, secretary. The library, to be formed at the Association rooms, will consist of not only all the necessary books and papers on engineering subjects of pertinent interest, but an accumulative indexed library will be kept on all topical engineering subjects. Results of all experiments and researches in metals, oils, tires, fuels, etc., will be digested and put in concrete form for distribution to the members of the Licensed Association. Experiments, tests, and formulæ emanating from the Association laboratory at Hartford and from the laboratories of all the licensed members will be chronologically and specifically tabulated. A digest of popular and scientific subjects appearing in current periodicals will be made, and metallurgical information collected from all steel manufacturers and producers. In this way the practical knowledge of the manufacturer and the theoretical research work of the scientist are made available.

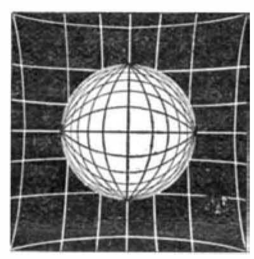
AN OPTICAL ILLUSION.

BY GUSTAVE MICHAUD, COSTA RICA STATE COLLEGE.

In a stereoscopic view two photographs, taken from two points not very far distant from one another, give the effect of relief when viewed through the instrument. It is commonly believed that this fact proves the necessity of binocular vision to obtain a relief effect. The following experiment shows that the same perception can be had with the use of one eye only and with a flat drawing, if the eye is deceived by some artifice which it is not educated to recognize as such.

Take a piece of pasteboard, and with a pin make a hole in it. Bring the pinhole quite close to the eye, and through it look at the accompanying figure. The figure should be in full light, and at a distance from the pinhole not over one inch. Under ordinary circumstances, every line would be blurred with the figure so uncomfortably near the eye; but the pinhole acts as a diaphragm, which decreases several of the defects of a short-focus lens, and the figure will remain distinct—not only distinct, but also changed in appearance. The central white disk will seem to bulge out of the black field as if it were a convex hemisphere. The perception of relief in that case is immediate, and as strong as it could be obtained with the stereoscope.

The illusion is partly the result of the abnormal curvature of the focal surface, the crystalline lens of the eye acting as a very short-focus lens in such a case. The lines drawn on the white disk and on the black field help to deceive the eye. Their crowding together near the edges of the disk causes them to resemble great circles drawn upon a sphere. Moreover, the eye is not free from distortion. If a few parallel lines running close together are looked at through a pinhole at a very small distance, they appear as if they were bent inward on the margin of the image. On the white disk the lines have been curved the way distortion would bend straight lines if they were brought close to the eye. On the black field white lines have been drawn so as to appear nearly straight in spite of the barrel-shaped distortion, which is the result of the position of the diaphragm before the eye when the crystalline lens assumes its greater convexity. The fact that the lines on the disk seem to be strongly distorted, while those on the field do not, probably causes the eye to underestimate the distance of the disk and to overestimate that of the field. At any rate, the illusion is much less striking if the lines be omitted. And if it be made with a black disk on a white field, every other feature of the experiment remaining unchanged, it again becomes evident that the effect of relief is not so easily perceived. Irradiation, which causes a luminous object to appear larger and nearer than a dark one, has a share in the production of the illusion.



A Diagram With Which an Interesting Optical Illusion Can Be Obtained.

A TWENTIETH CENTURY CAMPANILE.

With the purchase of the plot of ground fronting on Madison Square upon which the church of Dr. Parkhurst was for so many years a familiar landmark, the Metropolitan Life Insurance Company secured the remaining plot of ground of the whole block between Fourth and Madison Avenues and 23d and 24th Streets upon which the stupendous marble edifice of their home office building is located. The present building, which is ten stories in height, has a frontage of 200 feet by 425 feet.

The northwest corner of the block, recently acquired, is now being prepared for the foundations of a stupendous steel and marble tower which, on a base measuring 75 feet by 85 feet, will soar to a maximum height of 658 feet above the sidewalk and 690½ feet above its foundations. The main office building is in the pure early Italian Renaissance style, and its Tuckahoe marble, in the few years since its erection, has commenced to mellow down to a pleasing soft buff tone in color. The style and masonry of the main building will be preserved throughout the tower in the general designs and details, and the tower itself will be of the type of the famous Italian campanile which is such a marked feature of the Renaissance period.

As will be seen from our front-page engraving, this twentieth-century campanile will be chaste and severe in design, and of a grace and dignity of outline suitable to its stupendous proportions. As far as the fourth story the tower will conform in line and detail to the four lower stories of the main building. Above this the shaft of the tower will be simple and severe, consisting of three groups of triple windows on each side, with heavily molded and deeply recessed jambs. This method of treatment will be carried up throughout twenty-one stories with nothing to break its uniformity except a course of projecting marble balconies at the level of the main cornice of the main building. These balconies are intended to have the effect of carrying the strong line of shadow of the main cornice around the tower without breaking in upon the unbroken upward sweep of the piers and heavily rusticated angles of the tower. From the twenty-first to the twenty-third story at the height of 324 feet above the sidewalk, will be a great clock, the hands of whose four dials, one on each front of the tower, will be 12 feet in length, with figures 4 feet long, the diameter of the dial being 25 feet, 6 inches.

As a capping to the shaft there will be a line of projecting and paneled balconies, then a series of deeply-incased Ionic loggias with five arched openings on each face of the tower. Above these will be a deep frieze, a cornice, and a parapet balcony. Inside the balcony the walls of the tower will be offset to the extent of 8 feet inward from the face of the shaft. The offset section will be carried up for four stories and will form the base for a pyramidal termination, the sloping face of which will be covered not with copper, but with the same blue-white marble as the shaft. Above this will be an octagonal colonnaded observatory extending to a height of 658 feet above the sidewalk.

There can be little doubt that this stupendous marble shaft, when completed, will be an object of decided architectural grandeur and beauty. Its heavenward lift is such that full one-half of its bulk will rise absolutely clear even of the cornice line of New York city's loftiest building; and long before the traveler is within sight of the city itself he will be able to recognize the blue-white form of the tower in the far distance. So tall will it be that, even after the sun has set and the shadows of evening have fallen upon the streets below, the summit of the tower will be crimsoned with the rays of the sun that has already set behind the distant Orange Mountains. For it is a fact that the highest point of the tower will overtop the highest point of the Montclair hills, which, according to the Geological Survey map, is lower than the Metropolitan tower by about 30 feet.

The view from the upper floors will be simply superb. The most lofty rentable offices will be those of the forty-first story, whose floor will be 526 feet above the sidewalk. From this elevation Manhattan Island will resolve itself into its streets, blocks, and individual buildings with the distinctness and detail of a map. Indeed, practically the whole of Greater New York will, on a clear day, be discernible in the separate details of its topography, and the leading features of its streets and buildings. Those who have visited the Washington monument will understand how great will be the elevation of these office floors, when it is stated that the windows of the forty-first story will be at the same elevation as the lookout windows at the top of the monument.

The story of the dimensions and weights of the structure necessarily runs into large figures. Thus, there will be in the tower no less than forty-six stories above the sidewalk, and in the tower and the main building together there will be a total floor space of twenty-five acres. The steel framework will weigh about 8,100 tons. The weight of the steel work, masonry, etc., combined, will be 38,022 tons; the estimated live load when the building is occupied will be 5,591 tons, making a total weight of the whole building of 43,613 tons.

In designing a tower of this magnitude the stresses due to wind pressure reach a very high figure, and call for a large increase in the section of the columns, etc., to resist them. Thus, in the principal columns on the leeward side of the building, while the pressure due to the dead and live load combined is 7,500,000 pounds, the added load, due to the wind pressure, brings the total up to 10,400,000 pounds, while similarly the corresponding column on the windward side is relieved of pressure, the maximum load during maximum wind pressure being reduced from 7,500,000 to 4,600,000 pounds. From these figures it will be evident that even under the maximum wind pressure, such as would occur in a heavy westerly gale, there will never be any tendency on the part of the building to lift the columns on the windward side from their foundation. This great stability is due to the wider base and more massive construction of this tower as compared with the Singer tower, in which the foot of each column has to be anchored down to the heavy concrete caisson upon which it stands. The skeleton frame of the building is stiffened against distortion by means of heavy knee braces at every intersection of the vertical posts and horizontal floor beams, and the resulting bending stresses in the floor beams render it necessary to greatly increase their section. It can well be understood that the lower sections of the columns are of great size and weight, the large corner columns having a cross-sectional area of 540 square inches of metal. They are built of twelve 8 x 8 x 1 inch angles combined with heavy web and cover plates, the whole post weighing about one ton per linear foot. For the information upon which this article is based, we are indebted to Messrs. N. Le Brun & Sons, the architects, and Messrs. Purdy & Henderson, the consulting structural engineers.