

sented little difficulty, the south side of Hyde-park, between Kensington-road and Rotten-row, having been early selected as the locality.

The construction of the edifice, however, presented difficulties not so easily surmounted. The Building Committee, comprising some of the leading architects and engineers of the kingdom, among whom are Mr. Barry, the architect of the new Houses of Parliament, and Mr. Stephenson, the constructor of the Britannia Tubular Bridge, advertised for plans to be presented for the building. When the committee met, they found no want of designs; their table was loaded with them, to the number of 240. Their first task was to select those which were positively worthless, and throw them aside. By this process the number for consideration was reduced to about sixty; and from these the committee proceeded to concoct a design, which pleased nobody—themselves least of all. However, the plan, such as it was, was decided upon, and advertisements were issued for tenders for its construction. This was the signal for a fierce onslaught upon the proceedings of the committee. For the erection of a building which was to be used for only a few months, more materials were to be thrown into one of the main lungs of the metropolis, than were contained in the eternal pyramids of Egypt. Moreover, could the requisite number of miles of brickwork be constructed within the few weeks of time allotted? and was it not impossible that this should, in so short a time, become sufficiently consolidated to sustain the weight of the immense iron dome which, according to the design of the committee, was to rest upon it?

The committee, fortunately, were not compelled to answer these and a multitude of similar puzzling interrogatories which were poured in upon them. Relief was coming to them from an unexpected quarter: whence, we must go back a little to explain.

On New Year's Day, of the year 1839, Sir Robert Schomburgk, the botanist, was proceeding in a native boat up the River Berbice, in Demerara. In a sheltered reach of the stream, he discovered resting upon the still waters an aquatic plant, a species of lily, but of a gigantic size, and of a shape hitherto unknown. Seeds of this plant, to which was given the name of "Victoria Regia," were transmitted to England, and were ultimately committed to the charge of JOSEPH PAXTON, the horticulturist at Chatsworth, the magnificent seat of the Duke of Devonshire. The plant produced from these seeds became the occasion, and in certain respects the model, for the Crystal Palace.

Every means was adopted to place the plant in its accustomed circumstances. A tropical soil was formed for it of burned loam and peat; Newcastle coal was substituted for a meridian sun, to produce an artificial South America under an English heaven; by means of a wheel a ripple like that of its native river, was communicated to the waters of the tank upon which

THE CRYSTAL PALACE.

IN the early months of last year the Great Exhibition had become as nearly a "fixed fact" as any thing in the future can be. The place where and the building in which it was to be held, then became matters for grave consideration. The first point, fortunately, pre-



THE GREAT EXHIBITION BUILDING.

its broad leaves reposed. Amid such enticements the lily could not do otherwise than flourish; and in a month it had outgrown its habitation. The problem was therefore set before its foster-father to provide for it, within a few weeks, a new home. This was not altogether a new task for Mr. Paxton, who had already devoted much attention to the erection of green-houses; and within the required space of time, he had completed this house for the "Victoria Regia," and therein, in the sense in which the acorn includes the oak, that of the Crystal Palace.

While Mr. Paxton was planning an abode for this Brobdignagian lily, the Building Committee of the Exhibition were poring wearily over the 240 plans lying upon their table. They had rejected the 180 worthless ones, and from the remainder had concocted, as we have said, with much cogitation and little satisfaction, their own design. Such as it was, however, it was determined that it should be executed—if possible.

This brings us down to the middle, or to be precise, to the 18th of June, on which day Mr. Paxton was sitting as chairman on a railway committee. He had previously made himself acquainted with the case laid before them, and was not therefore under the necessity of now devoting his attention to it. He took advantage of this leisure moment to work out a design for the Exhibition Building, which he had conceived some days previously. In ten days thereafter elevations, sections, working plans and specifications, were completed from this draft, and the whole was submitted to the inspection of competent and influential persons, by whom it was unanimously announced to be practicable, and the only practicable scheme presented.

This design was then laid before the contractors, Messrs. Fox and Henderson, who at once determined to submit a tender for the construction of a building in accordance with it. In a single week, they had calculated the amount and cost of every pound of iron, every pane of glass, every foot of wood, and every hour of labor which would be required, and were prepared with a tender and specifications for the construction of the edifice. But here arose a difficulty. The committee had advertised only for proposals for carrying out their own design; but, fortunately, they had invited the suggestion on the part of contractors, of any improvements upon it; and so Mr. Paxton's plan was presented simply as an "improvement" upon that of the committee, with which it had not a single feature in common. This, with certain modifications, was adopted, and the result is the Crystal Palace—itself the greatest wonder which the Exhibition will present—the exterior of which is represented in our accompanying Illustration.

The building consists of three series of elevations of the respective heights of 64, 44, and 24 feet, intersected at the centre by a transept of 72 feet in width, having a semicircular roof

rising to the height of 108 feet in the centre. It extends in length 1851 feet from north to south, more than one-third of a mile, with a breadth of 456 feet upon the ground; covering 18 superficial acres, nearly double the extent of our own Washington-square; and exceeding by more than one half the dimensions of the Park or the Battery. The whole rests upon cast-iron pillars, united by bolts and nuts, fixed to flanges turned perfectly true, so that if the socket be placed level, the columns and connecting-pieces must stand upright; and, in point of fact, not a crooked line is discoverable in the combination of such an immense number of pieces. For the support of the columns, holes are dug in the ground, in which is placed a bed of concrete, and upon this rest iron sockets of from three to four feet in length, according to the level of the ground, to which the columns are firmly attached by bolts and nuts. At the top, each column is attached by a girder to its opposite column, both longitudinally and transversely, so that the whole eighteen acres of pillars is securely framed together.

The roofs, of which there are five, one to each of the elevations, are constructed on the "ridge and furrow principle, and glazed with sheets of glass of 49 inches in length. The construction will be at once understood by imagining a series of parallel rows of the letter V (thus, $\nabla\nabla\nabla$), extending in uninterrupted lines the whole length of the building. The apex of each ridge is formed by a wooden sash-bar with notches upon each side for holding the laths in which are fitted the edges of the glass. The bottom bar, or rafter, is hollowed at the top so as to form a gutter to carry off the water, which passes through transverse gutters into the iron columns, which are hollow, thus serving as water-pipes; in the base of the columns horizontal pipes are inserted, which convey the accumulated water into the sewers. The exhalations, from so large an extent of surface, from the plants, and from the breath of the innumerable visitors, rising and condensed against the glass, would descend from a flat roof in the form of a perpetual mist, but it is found that from glass pitched at a particular angle the moisture does not fall, but glides down its surface. The bottom bars are therefore grooved on the inside, thus forming interior gutters, by which the moisture also finds its way down the interior of the columns, through the drainage pipes, into the sewers. These grooved rafters, of which the total length is 205 miles, are formed by machinery, at a single operation.

The lower tier of the building is boarded, the walls of the upper portion being composed, like the roof, of glass. Ventilation is provided for by the basement portion being walled with iron plates, placed at an angle of 45 degrees, known as *luffer-boarding*, which admits the air freely, while it excludes the rain. A similar provision is made at the top of each tier of the building. These are so constructed that they can be closed at pleasure. In order to subdue the intense

light in a building having such an extent of glass surface, the whole roof and the south side will be covered with canvas, which will also preclude the possibility of injury from hail, as well as render the edifice much cooler.

In the construction of the building care has been taken to give to each part the stiffest and strongest form possible in a given quantity of material. The columns are hollow, and the girders which unite them are trellis-formed. The utmost weight which any girder will ever be likely to sustain is seven and a half tons; and not one is used until after having been tested to the extent of 15 tons; while the breaking weight is calculated at 30 tons. At first sight, there would seem to be danger that a building presenting so great a surface to the action of the wind, would be liable to be blown down. But from the manner in which the columns are framed together they can not be overthrown except by breaking them. Experiments show that in order to break the 1060 columns on the ground floor, a force of 6360 tons must be exerted, at a height of 24 feet. The greatest force of the wind ever known is computed at 22 pounds to the superficial foot; assuming a possible force of 28 pounds, and suppose a hurricane of that momentum to strike at once the whole side of the building, the total force would be less than 1500 tons—not one-fourth of the capacity of the building to sustain, independent of the bracings, which add materially to its strength. So that, if any reliance at all can be placed upon theoretical engineering, there can be no doubt as to the safety of the building.

Entering at the main east or west entrance, we find ourselves in a nave 64 feet in height, 72 in breadth, and extending without interruption the whole length of the building, one-third of a mile. Parallel with this, but interrupted by the transept in the centre, are a series of side aisles of 48 and 24 feet in breadth, with a height of 44 and 24 feet. Over the centre of the nave swells the semicircular roof of the transept, overarched the stately trees beneath—a Brobdignagian green-house with ancient elms instead of geraniums and rose-bushes. The whole area of the ground floor is 772,784 square feet; and that of the galleries 217,100; making in all within a fraction of one million square feet; to which may be added 500,000 feet of hanging-space, available for the display of the products of human heads and hands.

There are three refreshment rooms, one in the transept, and one near each end, around the trees which were left standing, where ices and pastry for the wealthy, and bread-and-butter and cheese for the poorer are to be furnished. No wine, spirits, or fermented liquors are to be sold; only tea, coffee, and unfermented drinks; pure water is to be furnished gratis to all comers by the lessees of the refreshment rooms.

In respect to the decoration of the interior, a keen controversy has been waged. The fact of

iron being the material of construction renders it necessary that it should be painted to preserve it from the action of the atmosphere. On the one hand, it is said that the fact that the structure is metallic should be indicated by the decoration, otherwise the whole will have no more appearance of stability than an arbor of wicker-work. Those who take this view recommend that the interior should be bronzed. On the other hand, those to whom the decoration is intrusted affirm that the object of using color is to increase the effect of light and shade. If the whole were of one uniform dead color the effect of the innumerable parts of which the building is composed, all falling in similar lines, one before the other, would be precisely that of a plane surface; the extended lines of pillars presenting the aspect of a continuous wall. In order to bring out the distinctive features of the building various colors must be used; and experiments show that a combination of the primary colors, red, blue, and yellow, is most pleasant to the eye. The best means for using these is to place blue, which retreats, upon the concave surfaces, yellow, which advances, upon the convex ones, reserving red for plane surfaces. But as when these colors come in contact each becomes tinged with the complementary color of the other—the blue with green, the red with orange—a line of white is interposed between them. Applying these principles, the shafts of the columns are to be yellow, the concave portions of their capitals blue, the under side of the girders red, and their vertical surfaces white.

Among all the wonders of the Crystal Palace nothing is more wonderful than its cheapness, and the rapidity of its construction. Possession of the site was obtained on the 30th of July; in a period of only 145 working-days the building was to all intents and purposes completed. As to cheapness it costs less per cubic foot than an ordinary barn. If used only for the Exhibition, and at its close returned to the contractors, the cost will be nine-sixteenths of a penny a foot; or, if permanently purchased, it will be one penny and one-twelfth. Thus: The solid contents are 33,000,000 cubic feet; the price if returned is £79,800, if retained £150,000. This simple fact, that a building of glass and iron, covering eighteen acres, affording room for nine miles of tables, should have been completed in less than five months from the day when the contract was entered into, at a cost less than that of the humblest hovel, opens a new era in the science of building.

As to the final destination of the Crystal Palace, it is the wish of the designer that it should be converted into a permanent winter-garden with drives and promenades. Leaving ample space for plants, there would be two miles of walks in the galleries, and the same amount for walks upon the ground floor; in summer the removal of the upright glass would give the whole the appearance of a continuous walk or garden.