



The Indian School exhibits, made by the United States government, are both interesting and remarkable. One school comes and stays nearly a month, then another, and so on, until each one has exhibited in turn. The exhibit during the early part of August was that of a Haskell Institute, at Lawrence, Kansas. Forty-six scholars were in attendance—thirty-one boys and fifteen girls, and these scholars represented twenty-three Indian tribes. A brass band of twenty-four pieces, composed entirely of boys in this school, played each morning at half-past nine. There was a constant stream of visitors passing through the school. One day's record was 21,000 people, and the first eleven days 148,500 people visited it. The display includes an exhibit of the work of the pupils in various stages of education, from the kindergarten to painting, drawing, and various occupations. The boys are at work making shoes, harnesses, clothing, carpenter work, etc. Many fine, strong faces are to be seen among the children of these schools.

Bark wigwams of the Cree and allied Indian tribes of the Northwestern Territory of Canada are shown, and there are several families in connection with this exhibit. The State of Maine sends as exhibits several families of Penobscot Indians, who have erected birch bark wigwams, in which they live and sell specimens of their handiwork, such as baskets and head work. The Winnebagos and Chippewas, from Wisconsin and Minnesota, are represented and occupy typical houses of hides and bark. Other Indian habitations are shown, of Tepees, Hogans, Navahos, Apaches, and other Western tribes. Three wooden huts are occupied by Quackuhl Indians, from Vancouver Island. In front of each is an immense totem pole, carved in grotesque fashion.

The State of New York represents the Six Nations, the Iroquois, Senecas, Mohawks, Onondagas, Cayugas, Oneidas and Tuscaroras. The confederation of these tribes, declared by Daniel Webster to be the most consummate piece of statesmanship in the history of the world, dates back many generations. Although the present representatives of these nations live like ordinary citizens in houses of wood or stone, many reminders of these early days are still carefully preserved. The Long House, built here at the Exposition, is an exact reproduction of the one that formerly stood on the site of the city of Albany, N. Y. It is forty-five feet long and twenty feet wide, and is constructed so that three apartments can be arranged on each side with a passageway through the center in which the council fires were built, one between each opposite pair of rooms. This building is constructed exactly keeping with the primitive style, not a nail or a pin being used in it—wedges of hickory or slippery elm being used. This structure is utilized as a salesroom, and many of the manufactures of these Indians are to be had here, all of them being made on the spot. The hereditary chief of the Six Nations must be a member of the Onondaga Tribe. This man, called in the native tongue Otataho, is Daniel La Forte. Mr. La Forte speaks English with perfect fluency, and is equally proficient in the tongue of each of the Six Nations, so that at the council meetings he is able to understand all that is said by a representative of any tribe, and if need be, can answer him in the same tongue. The first chief who arrived at the Exposition was Chief Luther Jack, who took an important part in the reception to the hardy mariners of the Columbus

caravels and the Viking ship. The accompanying illustration represents this chief with squaws of the same tribe seated in front of the railing surrounding the Basin, waiting for the reception to begin. Another important representative of the Six Nations is Thomas Webster, who is the chief wampum keeper.

The bark used in covering the Indian houses here shown is usually of basswood or elm. These structures represent the type of dwellings occupied by the members of the Six Nations at the time white men first came to America, and as a background to it there is shown near by a log cabin, which is an exact reproduction of the general type of cabin occupied by the early settlers of this country. This house is furnished in an exact reproduction of the early days, with a hand loom, spinning wheel, and all other furniture.

The two distinctive engineering concessions, that is the Ferris Wheel and the Movable Sidewalk, are proving very popular and give every indication of being among the most successful concessions in the Exposition grounds so far as financial returns are concerned. The wheel has an average daily attendance of eight or ten thousand people, and at this rate it will not only pay for itself, but probably give the stockholders a large dividend.

Tablets commemorative of the great work done at the Exposition by John W. Root, the architect, who did so much toward laying out and planning the Ex-

Germany, Holland, Canada, Mexico, Great Britain, Italy and from the United States and the army and navy. These papers discussed work in all lines of civil engineering, highways, railway matters, the construction of bridges, the building of canals, etc. Several of the most interesting and important engineering works now under way in various parts of the world were described by engineers connected with them.

The Mechanical Engineering Congress was opened by an address from Mr. E. B. Coxe, president of the American Society of Mechanical Engineers.

President Henry M. Howe, of the Institute of Mining Engineers, opened the Mining Congress. This division and the Metallurgical held a joint session. Mining schools were pretty thoroughly considered and various papers were read discussing mining and geological subjects.

Prof. Ira O. Baker opened the Congress of Engineering Education, and at the several sessions papers were read by professors representing the leading engineering schools of this country and Europe.

The Congress of Military Engineers opened with an address by Major Clifton Conly of the United States army. Prominent engineers and army officers attended and important papers were read discussing coast and other defenses, torpedoes, submarine work, fortifications, roads and bridges, transportation, the handling of troops, modern guns, and explosives.

Commodore George W. Melville, chief engineer of the United States navy, opened the division of Marine and Naval Engineering. In this congress, naval architecture and all matters pertaining to the construction, building, and equipping of vessels were fully discussed, papers being presented by engineers from various foreign nations as well as from engineers from the navy and leading ship-building concerns of the United States.

In the division of Aerial Navigation, Mr. Chanute delivered the opening address and many papers were presented. The subject of aerial navigation was discussed more freely and completely than ever before.

The members of the congresses visited the engineering works about the city of Chicago and inspected the work now in progress on the great drainage canal, which is expected to afford wholesome drainage for the city.

When I came to Chicago I was prepared to see a great Exposition, but I found it was even greater than my imagination could picture it. One walks all day seeing and

studying and examining with much earnestness, only to be disgusted at night because the day's work counts for so little in comparison with what there is to see. The exhibits are almost numberless, the areas of the building are estimated in acres; and because of the bigness of everything it is necessary to do a great amount of walking. In every direction there is something particularly to attract the eye. Nothing seems to be lacking that could add to the completeness of the picture. I am overcome by the conception of the Exposition and the lavish magnificence with which it is carried out, and it makes my patriotism simmer with pride to feel that this is a thoroughly American undertaking and is held in the bosom of the country.

Among the things that seemed strange to me was the number of wheeled chairs constantly moving about. I was not surprised to see a good many women riding, but at first I thought there must be an abundance of lazy men at the Exposition. After I had tramped vigorously two or three days and used myself up without seeing but a small part of the Exposition, I was not surprised that there were so many apparently lazy men. Even a professional pedestrian would find it a hard task to tramp about these buildings and grounds from early morning until late in the evening and not get used up. Another oddity is a little red camp chair of simple and almost crude construction which many people carried. These are hired for the day and can be returned at any booth. It is some bother to carry these chairs about, still they repay their cost of ten cents a day many times over.

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CHIEF LUTHER JACK AND SQUAWS OF THE SIX NATIONS.

position, and to Henry Sergeant Codman, the landscapist, who laid out the grounds, have been placed on the south front of the Fine Arts building. These tablets are offered by friends and associates of these two eminent men, all of whom worked together in the early days of the Exposition, and who perfected and carried out the marvelous work as now seen.

A remarkable exhibit in the Mining building is that of "carborundum," a new compound, which is made by combining silica and carbon by means of electrical action. This product possesses such remarkable grinding qualities that it cuts glass and polishes diamonds. Its abrasive qualities are believed to be greater than those of any other material, and this is particularly interesting from the fact that it is a manufactured and not a natural product.

The week beginning July 31 was devoted to the Engineering Congresses. These included eight divisions, as follows: Civil Engineering, Mechanical Engineering, Mining Engineering, Metallurgical Engineering, Engineering Education, Military Engineering, Marine and Naval Engineering, and Aerial Navigation. The divisions met in general session, when addresses were made. Thereafter each congress met in its own session and listened to the reading of papers and their discussion.

Eminent engineers from all parts of the world were in attendance and contributed papers, adding greatly to the value of the congresses.

In the Civil Engineering department the opening address was delivered by William Metcalf, president of the American Society of Civil Engineers. Papers were offered by eminent engineers from France, Portugal,

WORLD'S FAIR NOTES.

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The landscape gardening in the Exposition grounds is very grand. The park stretches along the southern shore of Lake Michigan and for about a mile there is a graceful curve with a low sloping beach upon which the waves splash, usually with the gentleness of a land-locked arm of the sea, but during a storm with a vigor that approaches that of the ocean itself. A broad promenade follows along the edge of the beach, giving a beautiful view of the lake and the many buildings that face it. Two canals extend from the lake into the center of the Exposition grounds, giving outlets to the waterways called the lagoons and the Basin with their connecting canal. These waterways, especially the lagoons, are superb. I am told these are not natural, but that they were dredged out and the earth taken from them used to raise the foundations of the Exposition buildings above the line of the swamp of which this park consisted before the Exposition was located here. The banks of the lagoons are lined with foliage, all aquatic shrubs indigenous to northern Illinois being transplanted.

In the center of the lagoons is what is called the Wooded Island. This is the garden spot of the grounds. It comprises about ten acres and is laid out with winding paths. Nearly all of its area is given over to the exhibits of flowers and flowering shrubs and foliage plants. The Basin is a body of water of considerable size walled in on all sides by walls of staff resembling marble, and surrounded by the noblest of the Exposition buildings. In fact, the region about this Basin is called the Court of Honor; here the illuminating in the evening is done, and in this vicinity are located the grandest works of sculpture and architecture.

The collection of old watches in the Swiss section of the Manufactures building is very curious, as it shows the gradual advancement of the science and art of horology from the clumsy affairs of former centuries to the life matchless timepieces of to-day. The oldest watch on exhibition bears the date 1074 of the Hegira, the watch being of Arabian workmanship. The watch has a hammered bronze case, which covers works of oriental simplicity. The hand marked the hours on a dial inscribed with Arabian numerals. A "Nuremberg egg," dated 1550, is shown, as well as a watch which dates from the time of the French revolution. The dial divides the day into ten hours and each hour into 100 minutes, according to a decree of the National Convention, which ordered that the decimal system be used for all measures. Some watches are shown which were made by the great-grandfather of Jean Jacques Rousseau. A wooden watch made by a Siberian convict attracts many visitors. The workmanship was so marvelous that such a workman could not be lost to art, and he was pardoned. Some of the modern watches are wonderful. Watches for rings, bracelets, etc., are shown mounted and unmounted. A spring in the back of a small beetle opens, displaying a tiny watch.

The lighting of the Ferris Wheel is effected by means of 1,400 electrical lamps.

A model of St. Peter's, at Rome, is exhibited near the Ferris Wheel, in the Midway Plaisance, by L. De B. Spindor. The model is 30 feet long, 15 feet wide, and about 15 feet high. Two men in front of the building, dressed in the orthodox uniforms of the Swiss guards of the Vatican, bid for custom with trombones. The model is made of wood, and is covered with a kind of varnish or stucco, which imitates stone. Various other models are included in the exhibit, as the Milan Cathedral, St. Agnes' Church, at Rome, the Piombino Palace, etc.

A gigantic flagstone is exhibited from Colorado. The stone is 25 feet long, 8 feet wide, and 10 inches thick.

A writer in the *Century Magazine* gives the following advice to visitors: Take a day first to satisfy your curiosity, to gratify your sense of wonderment and your love of beauty, to get your bearings and discover how much exertion you can support. Go all over the Fair grounds, and to the top of at least one of the big domes or towers. See the Fair, as a Fair, from its various centers and from different parts of its circumference, especially from the lake. I think you can do this in one or two days, if you start early and end late, if you are strong, and if you have yourself conveyed by all the available means of conveyance—encircling railways, boats, and rolling chairs—and if you do not step inside a single building except for the ascent in search of your bird's eye view. Then go home, stay in bed the following day, if you are wise, and the next day spread the wings and stiffen the spine of your conscience, and go in search of the things you have come to study—steam boilers or roses, fishes or stuffed birds, needle work or statistics of idiot asylums, methods of slaughtering men or cattle, or of preserving human life or edible fruits. Stay at this task until you have finished it, or until it has exhausted your powers of application. Then release and relax yourself. Go to see something else—palms if you have been studying plows, pictures if you have been studying electric motors.

THE WORLD'S COLUMBIAN EXPOSITION—A VIEW IN COLUMBIAN AVENUE, PALACE OF MANUFACTURES AND LIBERAL ARTS.

The Manufactures building is at once the wonder and the glory of the Fair. This huge structure, which is rectangular in form, measuring 1,687 by 787 feet, was designed by Mr. Geo. B. Post, of New York, and the great fabric abundantly testifies to Mr. Post's ability as an engineer as well as an architect. The Manufactures building is said to be the largest roofed building ever constructed, and some idea of its magnitude may be obtained when it is stated that the total floor space of both the main floor and gallery is forty-four acres. The Palace of Mechanic Arts at the Paris Exposition of 1889 could be placed inside the Manufactures building without touching any portion of the walls or roof, even with the Eiffel Tower laid flat on top. Seventeen million feet of lumber entered into the construction of the building, as well as 12,000,000 pounds of steel and five car loads of nails. The amount of staff used on the exterior could not be easily calculated. The total cost was \$1,700,000, and this cost would be entirely paid up if the building could be filled with an audience at \$5.65 a head, for the building would seat 300,000 people or three and three quarter times the seating capacity of the coliseum at Rome.

The exterior of the building is plain, which adds to its effect of grandeur. Decoration is entirely subservient to construction, and decoration is shown chiefly in the eight entrances, over each of which is a small dome, decorated by a celebrated American artist. All effects of color are obtained by flags and pennants on the roof. Crossing the bridge by the Electricity building, the main entrance is reached. There is really no difference in the entrances, but the one through which the greatest number of people enter the building, is called the main entrance. Passing under the beautifully decorated dome, the visitor enters the great building and in a moment stands in Columbian Avenue, the main thoroughfare through the building. Standing at the south entrance and looking north the effect is grand. On each side rise the exhibits of foreign nations, which in many cases come from thousands and even tens of thousands of miles. In the distance the clock tower breaks the seemingly endless vista. Overhead the huge trusses show the skeleton which forms the backbone of the building. Suspended from the roof are great coronas of arc lights, which alternate with huge flags.

At the left of our illustration will be seen the pavilion of a sister republic—Switzerland. The collection of watches in the Swiss section is very wonderful, and some of the tiny examples of the horologists' art seem almost too small to keep time. Directly beyond the Swiss pavilion rises the lofty tower of the Danish section. The exhibit of Denmark, and in fact all of the northern countries, is very creditable. A narrow aisle separates Denmark from Canada and Great Britain. Just beyond the clock tower will be noticed the obelisks surmounting the pavilion of Austria. At the right of the cut, near the bottom, is the section of Norway, which is admirably filled with the products of the land of the midnight sun.

Beyond the Norwegian section is the carved wood pavilion of Russia, which contains marvelous works executed in silver, malachite, rhodonite, and lapis lazuli. This section was opened by a mitered bishop of the Greek Church, with all the pomp and ceremony of the Greek ritual. The Belgium pavilion is beyond the Russian section, and beyond this again is the very ornate facade of the French section. The entrance to the French section is very imposing, and is justly admired. The column with the ball on the top, just beyond the clock tower, is the beginning of the United States section, the column being directly above the exhibit of Messrs. Tiffany.

Queen of the Evening Sky.

Venus, after an absence of nearly a year, has again made her appearance as an evening star, and may now be seen for a short time in the early evening in the west. She will continue to adorn the western skies during the remainder of the year, growing brighter and brighter, and not reaching her greatest brilliancy until the 6th of January next.

As Vesper, the evening star *par excellence*, this brilliant planet, which Homer, ages ago, apostrophized in words indorsed by all succeeding generations as "the most beautiful star that stands in the heavens," is always a welcome visitor and an object of keen interest for every one whose eyes are open to the beauties of the starry firmament. As a "naked eye" object, it stands without a rival. Even Jupiter, the giant of the solar system, and Sirius, the giant among the fixed stars, pale before Venus when at her brightest.

One would suppose that Venus would form a splendid object for a telescope. On the contrary, it is one of the most difficult objects in the heavens to see satisfactorily with this instrument. Its dazzling light brings out all the defects of a telescope, and, being low in the heavens after dark, it is always more or less tremulous. The best telescopic views of Venus are obtained in broad daylight, when it is high above the horizon. All astro-

nomical studies of it are made at that time. Thus viewed, with its strong light subdued by the glare of the day and posed upon a background of blue sky, it is indeed a beautiful object, resembling the moon seen under the same conditions, but free from the dark blotches that disfigure that luminary.

Venus has no markings distinguishable with a small telescope. It is interesting mainly for its changing phases. Being an "inferior" planet, and passing at times between us and the sun, it goes through the same changes of aspect as are familiar in the monthly changes of the moon, with the important difference that, being when "full" nearly seven times as far away as when in its most slender crescent phase, it undergoes a corresponding change in apparent size.

As it appears now, having but just emerged from behind the sun, it is nearly full. On December 6 it will be at its greatest apparent distance from the sun, and on January 6 it will have attained its greatest brilliancy. After this last date it will draw rapidly toward the sun, and its crescent will grow more and more slender until it becomes invisible, except through the largest telescopes.—*Phila. Record*.

An Invention Wanted.

United States Consul Edward Bedloe, writing from Amoy, China, to the State Department, says:

A fortune lies in store for the man who will discover some process for cheaply making wood proof against white ants. These pests are the curse of existence in Amoy and every other tropical or sub-tropical city. Their voracity is incredible. They ate the framework of a new door in this consulate in three weeks. In the same period they almost consumed a large and handsome cabinet in the court room and a heavy pinestee in the anteroom. Their work is invisible. They attack the wood from a mere point, through which they bore to the interior and there eat everything until only a shell or film remains. Wood which will successfully resist these insect pests must be thoroughly charged with some powerful chemical, both poisonous and non-evaporable. A solution of corrosive sublimate, chloride of zinc, arsenic, or antimony would seem to meet the want. But how to force these into the fibers until the latter are saturated, and to do so at a merely fractional cost of the wood itself, is the problem that confronts the inventor. The American genius is so prolific in invention and discovery that I feel assured the problem will be satisfactorily solved.

The Comet through Lick Lens.

Director Holden, of the Lick Observatory, has presented the *San Francisco Examiner* with an exact reproduction of a photograph made with the Lick telescope by Professor W. J. Hussey, of the comet now attracting attention in the northwestern sky. The plate was exposed from 9:10 to 10:20 on the evening of Thursday, July 13. The picture is intensely interesting.

It shows, says the journal mentioned, "what was doubtless the earliest apparition of the 'secondary' comet. In the tail of the great comet is to be plainly discerned the nucleus of an 'auxiliary' comet forming, just as the Holmes comet was seen to divide into separate components when Barnard photographed that very interesting object last November. Usually comets have been supposed to divide at the nucleus through some force not thoroughly understood, as in the case of the celebrated comet of Biela, or again when Sawerthal's comet of 1888 exhibited no less than three distinct nuclei. But with the Holmes comet, and that now under observation, the separation seems to be effected in the tail of the comet. It would certainly seem, from these photographs, that the tail of the comet must be composed of solid particles, else how could a secondary comet be formed from it?"

There is no record in all astronomical history of one comet within the tail of another. As yet there is not enough of data obtained to determine whether the comets have the same or different rates of speed, or whether they are near to or remote from each other. It may be that the "secondary" was formed out of the brighter comet, either through some internal disruptive action, or as the result of the more or less intimate contact with some other celestial vagrant like itself. Of course, comets have been known to dissolve. Some also have been observed to break up; but the parts have never been seen to present the like apparent relative positions as in the present instance. Theories to account for the phenomenon may be imagined in any number; but there are not enough of well-ascertained facts to sustain a single plausible one of them.

Large Guns for the Navy.

The experience of Great Britain and Italy has not tended to predispose our authorities in favor of exceptionally heavy ordnance. The 110 ton guns have been removed from Italian ships. The war vessels *Indiana*, *Massachusetts*, and *Oregon* are each to be supplied with four 13 inch pieces. They are nearly 40 feet in length. The diameter at the breech is somewhat over 4 feet and at the muzzle 21 inches. These guns throw a projectile of 1,100 pounds, with 550 pounds of powder as a charge.