Modern Projectiles.

The change from the old-fashioned cast iron balls to the accurate projectiles now required in gunnery is something remarkable. The projectiles made for the United States government by the Carpenter Steel Company, at Reading, Pa., are cast in moulds double the size of the finished shell. They are then hammered into shape in dies and machined, after which they are hardened by secret processes to proper temper and finally finished to exact dimensions, plugs being fitted in to fill the bored-out base of the chamber. If the shells are then truly concentric and balanced, two of each lot are fired at a hardened plate made of open hearth steel, this plate, which is backed by 3 feet of live oak backing, being one and a quarter times the thickness of the shell fired. If the shell penetrates the plate and backing without suffering injury, the lot from which it is selected is accepted. The steel used by the company in making projectiles is a special grade of chrome steel, and is of high tensile strength, the test pieces frequently averaging 110 tons to the square inch, with about 7 per cent elongation.

ROLLING CHAIRS AT THE EXPOSITION.

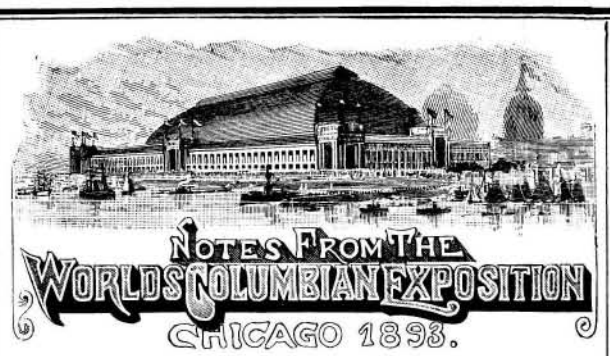
One of the first things to catch the eye of a visitor to the Exposition after a sweeping view, taking in the grounds and buildings as a whole, will be the rolling chairs, which are seen on every side. Not only invalids and ladies, but the tired world in general patronize these conveyances. These chairs, which are 2,400 in number, are provided by the Columbian Rolling Chair Company, and are the only surface conveyances allowed within the grounds. The rates are 75 cents per hour for single and $1 per hour for double chairs, with attendants to perform the manual labor, or if your wife or friend desires your attendance alone, you guiding and propelling the vehicle, the chair may be rented at the rate of 40 cents per hour for single or 60 cents per hour for double chairs. The attendants are all physically capable young men, from the various colleges, who wear a neat blue uniform. Our illustration is from the *American Jeweler*, and was made from an instantaneous photograph.

The Erie Canal Celebration of 1825.

The *Express*, Albany, says: "Magnificent as was the naval review, it had no more significance, nor possibly was it more interesting to the spectators of to-day, than the celebration which took place there in November, 1825, was to the people at that time. It was then that the first canal boat from the Erie canal reached New York. It had as passengers Governor De Witt Clinton and other State officials, and its most precious merchandise was two casks of water from Lake Erie. The boat left Buffalo October 26, and though there were no railroads, telegraphs or telephones then, the fact of its departure was made known in the city one hour and a half later. This was done by means of cannon placed at regular intervals along the entire route of the canal and the Hudson River. The firing of cannon in Buffalo announced the starting of the boat, and one cannon after another repeated the salute, until the last one was heard in New York 90 minutes after the first one was fired in Buffalo. There was great rejoicing. The boat was towed out to Sandy Hook, and the water from Lake Erie was solemnly poured into the Atlantic Ocean, together with water from the Ganges, the Indus, the Nile, the Seine, the Rhine, the Danube, the Orinoco, the La Plata, and other great waterways. Naval vessels of the United States and England took part in the demonstration. The Salamagundi Club is now arranging to take relics of that particular canal boat to the Chicago Fair, and proposes that water from the Atlantic be, in like fashion, poured into Lake Michigan."

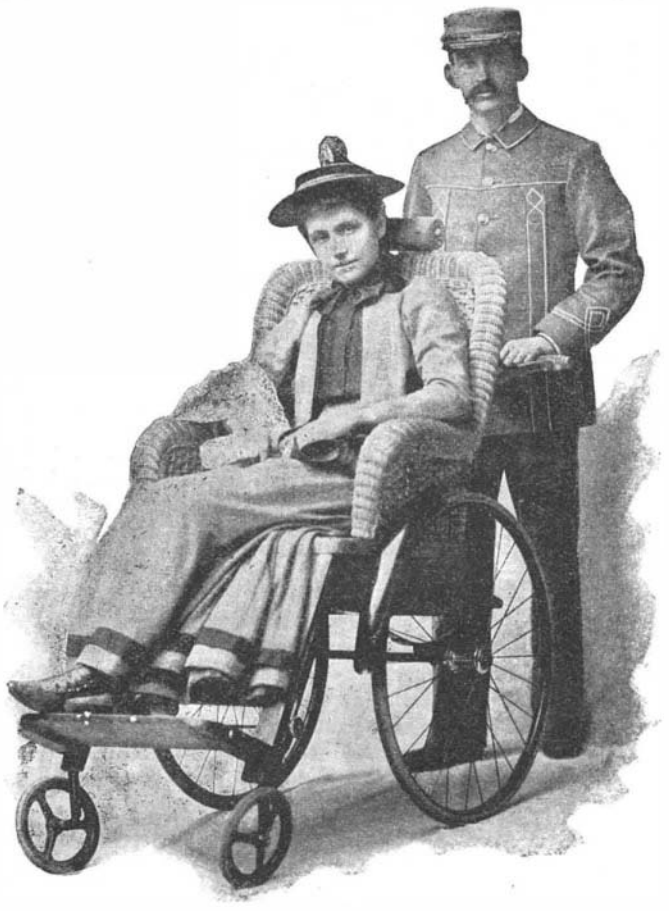
Trional as a Hypnotic.

We announced some time ago the introduction of this substance as a hypnotic. It is of the same family group as tetronal and sulphonal, but contains three ethyl groups instead of four in tetronal and two in sulphonal. Dr. Krauss, of Buffalo, in a recent number of the *New York Medical Journal*, describes his results with the drug as very encouraging, although he has used it in only small doses (from eight to ten grains) without repetition of the dose. The patients were all suffering from nervous diseases—such as Graves' disease, epilepsy, neurasthenia, trifacial neuralgia etc.—and in all of them, fifteen in number, except in those in whom peripheral nerve irritation was present, the results were gratifying. In the cases of the patients suffering from neuralgia the combination of trional with acetanilide was followed by sleep. A case of prurigo is the only one in which failure has to be recorded. No bad results followed the use of the drug, and the only apparent objection to its use in the United States is the fact that its producers have patented it and so made it less accessible for ordinary use.—*Lancet.*



The attendance at the Exposition during the month of May as officially reported was over 1,000,000 paid admissions. This gave the Exposition a gross income from this source of about $500,000, although some allowance is to be made for admission of children, as those from six to twelve years of age only pay twenty-five cents. In addition to this source of income there was considerable return from concessions. While the returns were comparatively small during May, the expenses were much larger than they will be during any other month that the Exposition is open. The reduction in the working forces has made a difference of perhaps $5,000 a week, so that it is roughly estimated that during the following weeks the necessary running expenses will not be over $15,000 a week, and possibly not over $12,000.

Thousands of people crowded recently in the evening at the Electrical Palace to witness the unveiling of the tower of light, which is by far the grandest display in electric illumination so far as one piece is concerned that could well be imagined.



COLUMBIAN EXPOSITION—A COMFORTABLE WAY OF SEEING THE SIGHTS.

The model war vessel State of Illinois was also delayed in being formally opened. This exhibit, which is made by the United States navy department, is a very attractive one for people who have never visited the sea coast and have not seen the steel cruisers which have been illustrated in the columns of the SCIENTIFIC AMERICAN. This model man-of-war is constructed after the pattern of the cruiser Oregon. On the evening of the day it was opened the vessel was electrically illuminated and the search lights added greatly to the effectiveness of the illumination. Strong light was thrown upon the vessel from the powerful search lamp stationed on the northeastern corner of the promenade on the roof of the Manufactures and Liberal Arts building.

The fine display of machinery which is made by German manufacturers in the Palace of Mechanic Arts was speeded up on June 1. The exhibit made by the Germans in this department is really very fine, both in the quality and extent. Next to the United States the German exhibit is the most interesting. It includes an excellent showing of electric and power machinery, wood-working machinery, etc. The Mexican exhibit in the extreme southwestern corner of the Manufactures and Liberal Arts Palace is most creditable to that country. It includes specimens of native manufactures, such as clothing, pottery, carvings and the like. Cotton and woolen goods made in Mexico are also shown. Much work is that of the native Indians.

Two State buildings have been dedicated with considerable ceremony, those of Kentucky and California The Kentucky building is purely a club house, but the opening ceremonies were quite elaborate, because in connection with them was the unveiling of a monument to Daniel Boone. The California building is one of the largest State buildings on the grounds. In appearance it is far ahead of most of the State buildings; in fact, California has made a much finer display than any other State excepting possibly Illinois. The building is a reproduction of the old mission station at Santa Barbara. Much taste has been displayed in laying out the grounds around the building. Inside there is a splendid display of the products of the State.

On June 1 the Children's building at the Exposition was formally opened with appropriate exercises. The scheme of erecting the building and arranging its use was the work of the ladies connected with the Exposition management. There was no money, however, that could well be used for this purpose, and the first question was to raise the funds. Some of the generous ladies of Chicago held a grand bazar and in other ways secured more than enough money to carry out the idea. There has been collected in this building a great variety of toys, playthings, books and all devices adapted to the purpose of entertaining and educating children. The Japanese took much interest and sent many contributions. A *creche*, with a checking system, so to speak, is established, so that women who wish to attend the Exposition, and have no particular means of caring for their young children, can bring them to this building and have them properly looked after. Another line of usefulness shows the different systems of educating children in the kindergarten work and in kitchen gardening. Every facility is at hand for accomplishing these and other lines of work for educating children. The roof of the building is arranged as a sort of playground, and in the center of the building on the first floor is a gymnasium where the children indulge in calisthenic exercises. Sloyd and physical culture are included in the work. This building is located between the Woman's building and the north end of the Horticultural building.

As to musical entertainments, the programme during the month of May included twenty free popular concerts, twelve symphony concerts, three musical festivals and three chamber concerts. The programme for June includes four Russian concerts, Handel's "Messiah," Bach's "St. Matthew's Passion," concert by the Exposition festival orchestra of 150 pieces, Gounod's "Third Mass," three grand festivals of 1,500 voices and 200 instruments with eminent soloists, Brahm's "A German Requiem," concert by the Brooklyn Arion Society, Handel's "Messiah," Bach's "St. Matthew's Passion."

A GENERAL GLIMPSE AT THE EXPOSITION.

A correspondent gives his impressions as follows:

The facilities for reaching the Fair grounds are at the present time more than sufficient to carry the visitors. The elevated railroad is in fine running order, and takes the passengers directly into the grounds; but the running time is rather long, owing to the distance and the number of stations. The steamers also require a long time to make the trip; but if the visitor's time is limited, the World's Fair express trains on the Illinois Central offer a quick and cheap method of reaching the grounds. The open cars are familiarly called "cattle cars," but they will prove very acceptable during the heated term.

The 64th Street gate is, in many respects, the most pleasant entrance to the grounds, and is the nearest entrance for the Administration and Manufactures buildings. The visitor buys his ticket at the little ticket booth and passes through the turnstile. As there are turnstiles for passes, workmen, and children, as well as the regular ticket gate, there may be some trouble in finding the proper gate the first visit. Once past the turnstile, and the visitor will make his first acquaintance with a unique feature of the Exposition—the Columbian guard, who is without the power of making an arrest, for they can only summon the patrol wagon, which carries a city policeman, and who is without a club for defense, though they have a preposterous little sword. Still the guard's uniform is pretty, and they serve to give a little color to the scene. The guards are polite, and on the whole do not deserve one-half the fun poked at them by the papers, which, in many cases, is the result of ill-nature on the part of reporters. It appears to have been the aim of the directors to put everybody in uniform. The guards are dressed in blue, as are also the sellers of the official guide. The official catalogue boys have a distressingly bright red uniform, while the guides are habited in gray, and the chair pushers (a handsome body of young men) in a light blue uniform, which ladies would describe as fetching. Every one connected with the Fair must march, and it is very amusing to see the ticket takers leaving the turnstiles and marching two by two with their big tin boxes. The central railroad station, near the 64th Street entrance, is a large structure, and

(*Continued on page 374.*)

NOTES FROM THE WORLD'S COLUMBIAN EXPOSITION.

(*Continued from page 371.*)

the terminal facilities will be ample for some time to come, if the railroads do not alter their policy.

The Transportation building being near the entrance attracts a great deal of attention and deservedly so, for the exhibits are wonderfully complete. The Mines building is worthy of considerable study; the center of attraction is, of course, the silver statue of Ada Rehan. In the galleries are several fine collections of minerals, including an exhibit by the Messrs. Tiffany and a portion of the private collection of their gem expert, Mr. Kunz, who has brought on his splendid collection of books, pamphlets, etc. The machinery exhibit is not equal to that of the Centennial as regards the actual processes of manufacture which were shown in 1876, though, of course, the electrical features largely compensate for this loss. The Administration building on the whole is rather disappointing and suffers by comparison with the Administration building at Paris, in 1889. The gilding on the dome appears dull, but at night the effect produced by the incandescent lamps and the huge gas torches is superb.

Standing at the MacMonnies fountain and looking toward the statue of the Republic, with the Peristyle and blue lake beyond, some idea is obtained of the wonderful harmony of the group. There is nothing incongruous, and the proportion of each building, when considered in reference to the next, would lead a stranger to believe that the whole group must have been the creation of one mind. It is safe to say that never, since the time of the grandeur of Rome, has there been such a remarkable collection of buildings grouped together. When the sun shines on the buildings, the effect is superb. Music floats over the water from one or the other of the two band stands, the noiseless little electric launches speed hither and thither, the gondolas propelled by swarthy Beppo and Espero, from the Grand Canal, glide past—the picture is almost too beautiful, and the half hour spent in the contemplation of the glorious and ever-changing panorama is indelibly fixed upon the memory. At night the scene is, if possible, even more grand, with the buildings outlined in incandescent lamps and amid the glare of the gas torches, which are occasionally paled by the search lights. A gondola ride at night is something not soon forgotten by the untraveled, while to those who know Italy it brings back memories of the Piazetta and the gorgeous moonlight nights for which Venice is justly celebrated.

The Agricultural building is slighted by many who use it as an approach to either the Monastery and Krupp's exhibit or in the midday trip to the Casino. The Manufactures and Liberal Arts building is so large that an idea of its size can only be obtained by a trip to the top of the building. The elevators run through one of the great coronas of arc lights. The view from the top is the finest which can be obtained in the grounds. The exhibits of the great building would require a long time to study in detail. The exhibits of Germany are particularly attractive. The prices of articles are very reasonable and the Exposition affords a good chance to pick up bric-a-brac at moderate prices. The educational exhibit is very interesting, the exhibit of the German universities being particularly so. There is a patrol day and night under the floors of the great building, safe deposit vaults are provided at each end of the building at moderate rentals. Skipping the Government building, it is a pleasant walk over the Wooded Island to the Fisheries building, or rather it might be a pleasant walk if the walks were in a proper condition. The walks all through the grounds with a few exceptions are made either of gravel or broken stone, which hurt the feet cruelly when the feet have been rendered tender by the enforced walks, for the facilities for getting around the grounds are inadequate, the electric launches perhaps being the most useful means of locomotion. The intramural railroad is a fine road, but only skirts the grounds, affording a fine view of the "back yard" of the Exposition, which it is just as well that the visitor did not see. The beauty of the Fisheries building is rather in its architecture than in its contents. The Government building and the brick man-of-war are thronged all day long.

Victoria House, to which the public, with true British exclusiveness, are not admitted, cost $120,000 and holds a priceless treasure, or rather curiosity, a London policeman direct from the wilds of High Holborn. This interesting creature is so hedged around with Columbian guards that it is difficult to get a view of him. The exhibit of the city of Paris, showing the way the city is drained, cleaned, policed, etc., is very interesting, and the method used in identifying criminals attracts a great deal of attention, but ladies shun the gruesome-looking camera which is used to photograph the dead in the position they were killed.

Near the Fisheries building is an odd-looking construction all covered with towers. This is the marine cafe, which supplies marine food only, and enjoys with the Casino the distinction of being the best restaurant on the grounds. The prices for all eatables in the Fair are high, but not, perhaps, unduly so, considering the inevitable percentage which the administration receives on all eatables, modes of locomotion and amusements. The revenue of the Fair from popcorn and soda water alone must be enormous. An unjust cause for complaint is the charge of one cent a glass for spring water, which is brought by pipe from the Waukesha spring and refrigerated on the grounds, clean glasses being supplied by the attendants. Distilled water for drinking purposes is provided free of charge.

The Art galleries and the State buildings afford pleasant places to rest. The art collection is uniformly good, though there are few pictures before which groups of people linger as they did at the Centennial. The United States collection is very fine, though there are some names which should have appeared, like Remington's. Blashfield's Christmas Bells in the first room of the United States section attracts numbers of visitors by the excellence with which the patina on the bell is rendered, as well as by the composition. Boys in their fiendish suits of red, selling catalogues, are a public nuisance in the Art building, and their loud voices should be suppressed at once.

One curious feature about the State buildings is that the buildings of the East make little or no display of products, etc., and deal purely with the social side, while the mania for exhibition increases as we go West, and the buildings become larger, wilder, and "more woolier," until it culminates in the enormous shed called the California building.

The Esquimaux Village is very interesting, and is in the main inclosure. The inhabitants snap coins out of the ground with long dog whips, to the infinite delight of the spectators.

The Plaisance is a delightful place to spend an hour or two after fatiguing sight-seeing. The Ferris Wheel may be the center of attraction later on, but at the present time the Cairo Street and the Dahomey Village vie with each other to see which can sell the most tickets. Once inside the magic inclosure and we are transported to Egypt, and in a moment we are surrounded by camel drivers, donkey boys, and urchins, and yells of "Yankee doodle donkey, Bismarck donkey, Gladstone donkey, you no 'fraid," are heard ceaselessly. The Nubian, the Cairene, and the Soudanese elbow each other in their efforts to get money. The scenes in the street are very picturesque, and the street well repays a daily visit. The Dahomey Village is very popular, and the Amazons' dancing is very curious, to say the least, while the color of these people is superb, being a rich chocolate brown. The Chinese theater and orchestra make day and night hideous with horrible sounds, and it is to be hoped that a similar orchestra in the Celestial Empire, or any other well regulated country, would receive condign punishment. The Hagenbeck animal show still draws large audiences, and the mournful-looking lion who rides a bicycle elicits peals of laughter. Let us take a Sedan chair and return once more to the 64th Street entrance, where our "cattle train" awaits us.

The Fair is a wonderful creation, and should be visited by every one, without regard to idle newspaper stories of extortion. Chicago covers an enormous amount of territory, and if there are not hotels enough, Chicago will build more. And there is another reason why all should go—the Fair needs the money.

The Columbus Building, Chicago.

One of the most attractive buildings architecturally that has recently been constructed in Chicago is the Columbus Memorial building, which stands on the corner of State and Washington Streets. This building is fourteen stories high, and the material of which it is built is terra-cotta. On the corner of the building is a tower rising considerably above the roof, and at the top of this tower is a large globe representing the earth, with ribs on it denoting the equator, tropics and other meridians, and inside the globe is an arc lamp of 15,000 candle power which burns each night. From the height of the globe from the ground and the location of the building, this light is a conspicuous beacon for a long distance from out on the lake as well as in the suburbs of the city.

In addition to the somewhat novel feature of this lamp in the globe, there are interesting features in connection with the electric plant which has been installed in the building. The engine is a 300 horse power high speed engine, and it runs two dynamos of sixty kilowatts each, and another dynamo of forty-five kilowatts. This plant is installed in the basement, while up in the fourteenth story is the largest electric storage plant that has yet been installed in Chicago, if not in the country. This storage plant consists of two complete sets, one of 174 cells of 300 ampere hours, 110 volts, the other of 96 cells of 300 ampere hours, 50 volts. The battery of 96 cells is used solely for running the 15,000 candle power arc lamp in the globe, while the 174 cell battery is used for the public lighting in the building, that is, for lighting the halls, stairways and other parts that the owners of the building provide lighting for. The forty-five kilowatt dynamo is shunt wound, and is intended especially for charging the storage batteries. The storage battery complete, with the 270 cells, weighs twelve and one-half tons. The arc lamp which supplies the light in the globe has been specially constructed for this purpose; it uses a carbon an inch and a half in diameter.

In Europe storage batteries are used extensively, but heretofore they have not been popular—nor have they been an entire commercial success—in this country. For this reason the success of this plant in the Columbus Memorial building will be watched with much interest. Two small storage battery plants have been used in Chicago for lighting purposes for a year or two, but what their efficiency or commercial success has been is not known.

Demonstration of Sound Waves.

Prof. V. Dvorak, of Agram, *Nature* says, "uses a very simple apparatus for demonstrating the oscillation of the air in sound phenomena. In an ordinary resonating sphere the short neck is replaced by a small metal plate with a conical hole opening inward, its shortest diameter being about 2 mm. When the resonator sounds, the passage of air through the hole is strong enough to extinguish a lighted match. If a small paper wheel resembling a water wheel is placed a little below the opening, and the resonator stands about 3 cm. in front of a wall, the blowing of a horn, or the singing of the proper note, is capable of setting the wheel in rapid rotation. A very serviceable lecture apparatus for measuring the intensity of sound is illustrated in the *Zeitschrift fur Physikalischen Unterricht*. A narrow glass tube bent at a very obtuse angle is half filled with alcohol. One end of the tube has a conical opening, and this is placed at a distance of 0·5 cm. from the opening of the resonator described. The whole is mounted on a board capable of adjustment to any angle. The puffs emitted from the resonator when responding to a sound affect the level of the alcohol, and the displacements are read off on a scale attached to the tube, projected, if necessary, on to a screen. Another effect of sound easily observed is that of repulsion. A light resonator of the ordinary construction is floated on water, its axis being kept horizontal by means of an attached piece of wire. On blowing the horn, the sphere will float in the direction opposite to that in which the neck is pointed. To produce continuous rotation, four resonators are attached to a light cross of wood turning on a needle point, or one resonator with four bent necks is suspended by a thread. If this acoustical reaction wheel is placed in one corner of the lecture theater, it can be set rotating from the opposite corner by a strong tuning fork, or even by singing through a conical tube."

Solid Magnesia Fire Bricks.

At a recent meeting of the Society of Civil Engineers, Paris, a discussion took place on the possibility of obtaining higher temperatures in steel furnaces. At present the temperature is limited by that at which the walls of the furnace begin to fuse, and even Diners fire bricks are not proof against this. Magnesia is claimed to be capable of standing far higher temperatures than the Diners brick. It is used, according to a statement made at the meeting referred to, by M. Lencauchez, and was first proposed by M. E. Muller in 1869. The principal difficulty in using it is the excessive shrinkage to which it is liable when heated. Thus a cube of magnesia of 10 inch edge, in the raw state, is said to shrink to one of 6 inch edge, when sufficiently calcined. For this reason furnace linings made of this material were liable to crack badly. The remedy for this state of things is to cause the magnesia to undergo its maximum possible contraction before being placed in the furnace, but for this an excessively high temperature is required. These difficulties have, it is claimed, been overcome, and M. Lencauchez showed the Paris Society of Civil Engineers a number of perfectly solid bricks of magnesia, which were as dense as granite, and had been thoroughly shrunk. On analysis the bricks are found to have the following composition:

Silica	1·50	to	2·50
Alumina and iron oxide	0·75	"	1·25
Lime	1·50	"	3·00
Magnesia	96·25	"	93·25
	100·00		100·00

The high temperature required to insure that the bricks shall not be liable to further contraction is obtained by suitably designed gas kilns.

DR. BREWER, of Cambridge, making all allowance for the Chinese inventive, lying faculty, allows them to have been acquainted with the properties of the magnetic needle B. C. 1715; while the early French Jesuit priests, who had no interest in supporting any mythical stories in the land of their adoption, believe trade routes and canals to have been in existence about the same period; that a system of regular marriages had been introduced among the people; that weaving was understood; banks and bank notes in existence; gunpowder; a regular calendar reformed B. C. 1498; a knowledge of lunar eclipses, and a division of the people into classes, each wearing a dress distinguished by its colors.