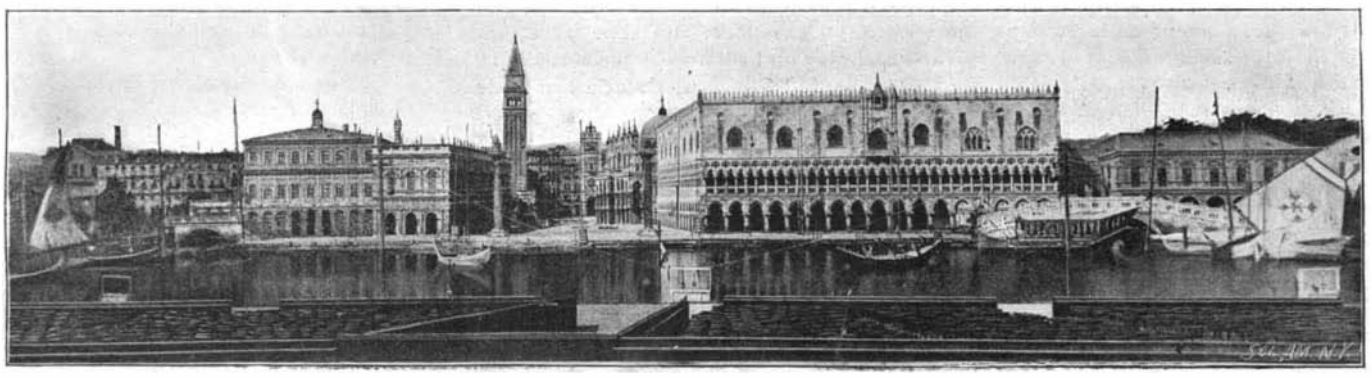
FIREWORKS AS AN ADJUNCT TO DRAMATIC ENTERTAINMENT.

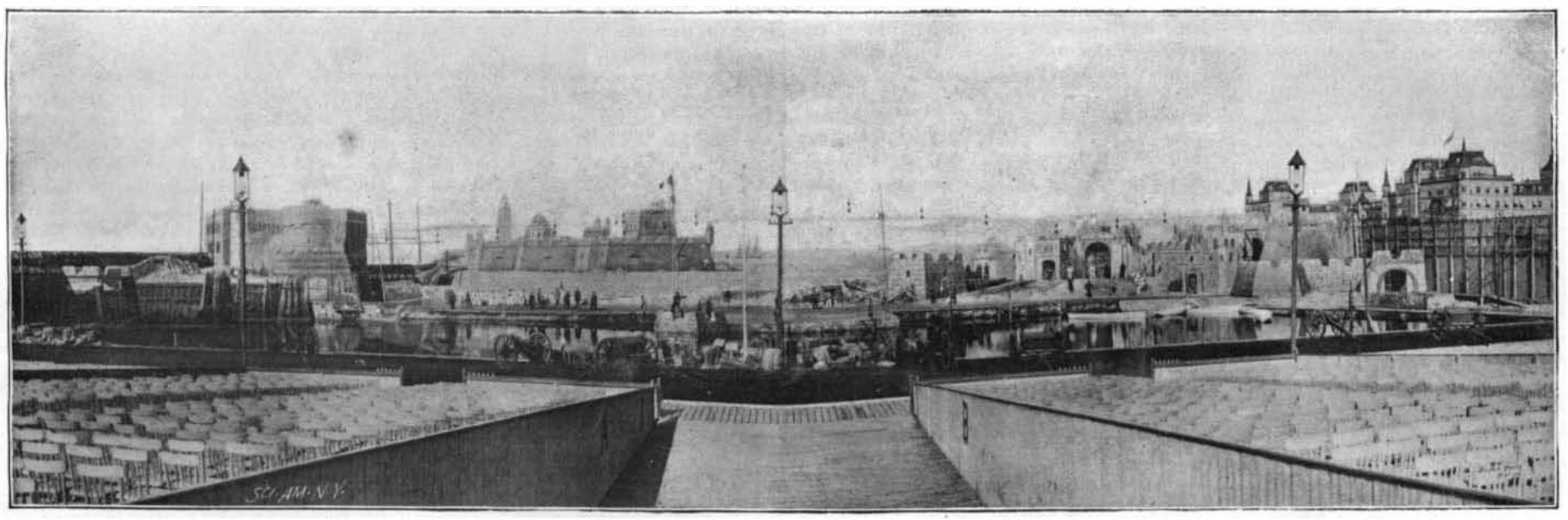
The love of show and the spectacular is inherent in human nature. Games and entertainments on a large scale always have appealed to the popular taste. An important factor in such spectacles now is the display of fireworks, in the love of which the American can sympathize with the Oriental. As far back as 1879, Mr. James Pain gave his first spectacular production at Manhattan Beach, one of New York's most popular resorts, and since that time their popularity has greatly increased. It is perhaps more proper to speak of these entertainments as fireworks with dramatic accessories than to call it a drama with fireworks as an accessory; for the raison d'être of the entire performance depends, not on the loosely hung together plot, but on a gigantic display of fireworks, which should be accompanied by enough of realistic stage setting and dramatic performance to give a good excuse for the display. The Pain Pyro-Spectacle Company, of New York City, have a large number of these productions, of which about seven are in use at one time. These are moved about from place to place, so that, in the course of the season, some thirty or forty cities are visited, the length of the stay varying from one week to a whole season. Strange as it may appear, these mammoth plays, as regards their scenery, are interchangeable as in any theater, the grounds in which the scenery is installed being of the same general dimensions in all cases. This, of course, greatly simplifies a change of performance.

An amphitheater is provided for the spectators in a rectangular inclosure which may seat as many as 10,000 persons. These inclosures are usually open to the sky, thus adding to the illusion. The seats slope away until the water is reached. Here will be found an artificial lake, usually 318 feet long and 150 feet wide, the width of the entire stage being about 350 feet. Behind the pond is a stage mounted with set scenes. Of course, owing to the distance and darkness, the refinements of acting would be entirely lost. The management, therefore, depends almost entirely upon the spectacular, the cast including hundreds of performers, including companies of clever gymnasts and acrobats.

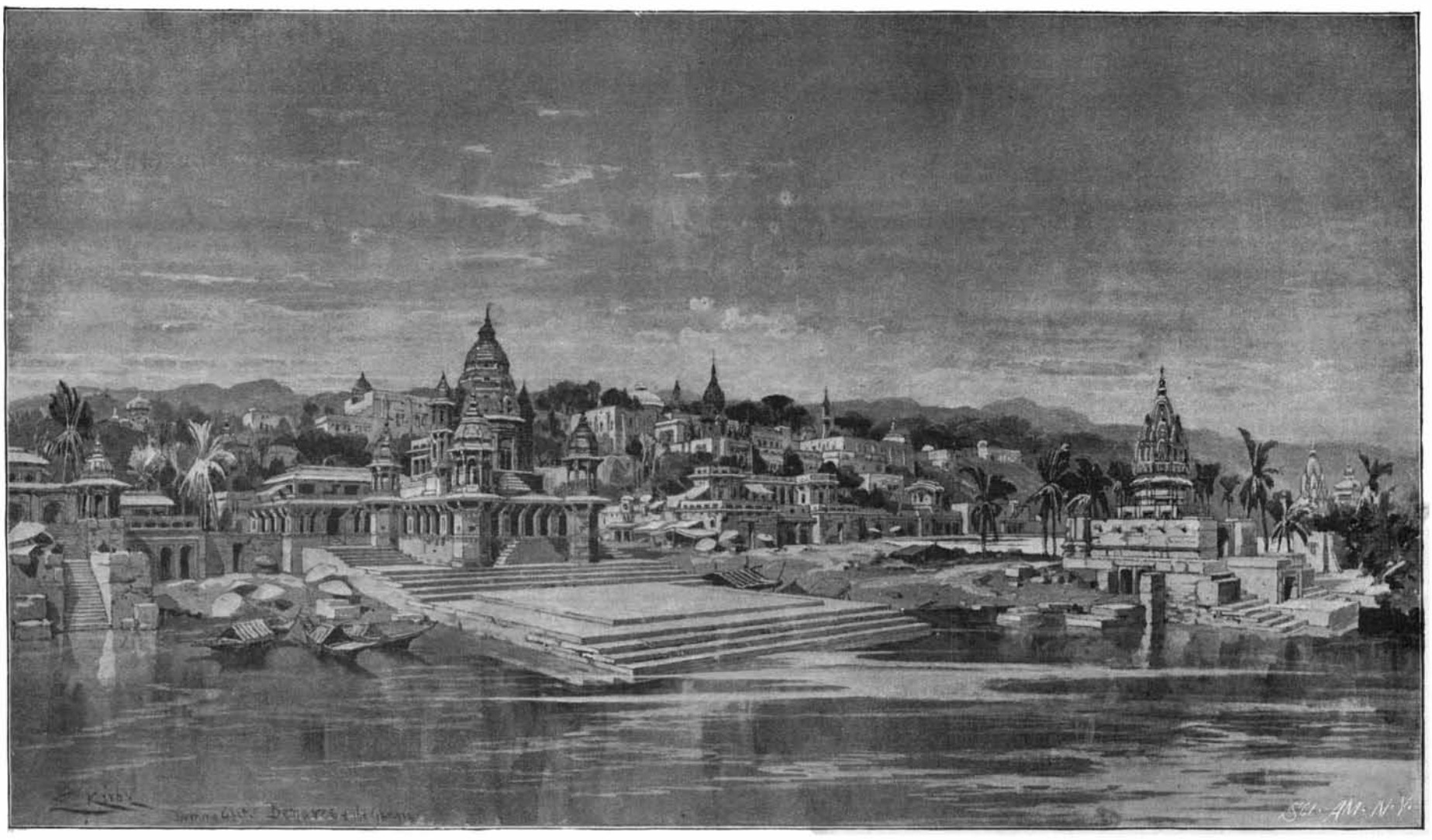
The clever manner in which the scenery is prepared may be judged by examining the engraving showing the Grand Canal at Venice, which is an exact reproduction of the original in every detail. The canal is filled with gondolas and with the gayly painted sails of the Adriatic, and the dome of St. Mark's may be seen in the background, with the graceful campanile at its left, while the center of the scene is filled with the delicate detail of the Doge's Palace. The performance is so arranged as to lead up to some stirring catastrophe. The climax is generally some awful cataclysm or some blood-curdling war scene or a great conflagration. In the Last Days of Pompeii, Vesuvius begins to belch forth flame and



CARNIVAL OF VENICE.



SIEGE OF VERA CRUZ.



BENARES, THE SACRED CITY ON THE GANGES.

FIREWORKS AS AN ADJUNCT TO DRAMATIC ENTERTAINMENT.

lava, the people struggle to escape from the falling brands and cinders, and in their haste plunge into the lake for protection, where they swim to the other shore or are rescued by those who are sailing in the vessels in the harbor. All is terror and confusion, and the noise is deafening. Sometimes there are deadly battles by land and sea. Vast bodies of troops surge backward and forward. Many are struggling in the water, which, fortunately for them, is not very deep.

Some idea of the scenes may be obtained from our engravings, which represent the Carnival of Venice, the Siege of Vera Cruz, and Benares, the Sacred City of the Ganges. Unfortunately, it is not possible to give an adequate idea of the spectacular effect of any one of these scenes when from two hundred to three hundred and fifty performers and pyrotechnists are engaged in working the gigantic affair. Among the other productions which have been, and still are in use, are the Last Days of Pompeii, Lalla Rookh, Paris from Empire to Republic, Storming of Pekin, Fall of Vicksburg, Japan and China, Moscow, Fire of London, Sardanapalus, Tel-el-Kebir, Sebastopol, Bombardment of Alexandria, and lastly Cuba, which is now being performed at Manhattan Beach.

In the SCIENTIFIC AMERICAN for July 31, 1886, will be found a full description of the actual method of working the stage scenery and obtaining the pyrotechnic effects. Of course the pyrotechnic part of the exhibition is in the hands of trained experts who travel with the entertainment. The materials are all shipped from New York.

The trolley road is now becoming a factor in the amusement business and many of the roads are catering to the entertainment of the public. Thus, a Pittsburg road gives $100,000 for the establishment of a zoological garden, and many others have tried various other more popular shows, such as the fireworks we have described, and the results so far have been very gratifying.

The Damascus of To-day.

A correspondent of the Baltimore Sun, writing from Damascus, Syria, May 1, gives the following very interesting account of this great city that was standing before Abraham's time.

While the ancient cities along the Nile are known only by the magnificence of their ruined temples, while Baalbec and Palmyra have long since passed away, while Babylon is a heap in the desert and Tyre a ruin on the shore, Damascus, which Josephus declares was standing before Abraham's time, and which is called in the prophecies of Isaiah "the head of Syria," is to-day, as it has been for thousands of years, a mighty city, influencing the customs and trade of a region of hundreds of miles around it.

Its importance in the flourishing period of the Jewish monarchy we knew from the garrisons which David placed here, and from the opposition it presented to Solomon. How close its relations continued to be with this people we infer from the chronicles of Jeroboam and Ahaz and the prophecies of Isaiah and Amos. Its mercantile greatness is indicated by Ezekiel in the remarkable words addressed to Tyre: "Damascus was thy merchant in the multitude of the wares of thy making for the multitude of all riches, in the wine of Helbon, and white wool." Alexander the Great saw its greatness, and sent Parmenio to take it while he was engaged in marching from Tarsus and Tyre. Julian the Apostate describes it as "the eye of the East." Recognized at one time as the metropolis of the Mohammedan world, its fame is mingled with the exploits of Saladin and Tamerlane. The tradition that the murder of Abel took place here is alluded to by Shakespeare (I King Henry VI, 1, 3):

> Winchester: Nay, stand thou back, I will not budge a foot:
> This be Damascus; be thou cursed, Cain,
> To slay thy brother Abel if thou wilt.

The cause of its importance as a city in all the ages is easily seen as you approach it from the south. Miles before you see the mosques of the modern city, the fountains of a copious and perennial stream spring from among the rocks and brushwood at the base of the Anti-Lebanon, creating a wide area about them, rich with prolific vegetation. These are the "streams of Lebanon," which are poetically spoken of in the songs of Solomon, and the "rivers of Damascus," which Naaman, not unnaturally, preferred to all the "waters of Israel." This stream, with its many branches, is the inestimable treasure of Damascus. While the desert is a fortification round Damascus, the river, where the habitations of men must always have been gathered, as along the Nile, is its life.

The city, which is situated in a wilderness of gardens of flowers and fruits, has rushing through its streets the limpid and refreshing current; nearly every dwelling has its fountain, and at night the lights are seen flashing on the waters that dash along from their mountain home. As you first view the city from one of the overhanging ridges, you are prepared to excuse the Mohammedans for calling it the earthly paradise. Around the marble minarets, the glittering domes, and the white buildings, shining with ivory softness, a maze of bloom and fruitage, where olive and pomegranate, orange and apricot, plum and walnut, mingle their varied tints of green, is presented to the sight, in striking contrast to the miles of barren desert over which you have just ridden.

Damascus remains the same true type of an Oriental city. Caravans come and go from Bagdad and Mecca, as of old; merchants sit and smoke over their costly bales in dim bazars; drowsy groups sip their coffee in kiosks overhanging the river; the bread boy cries aloud, "O Allah! who sustainest us, send trade;" the drink seller, as he rattles his brass cups, exclaims: "Drink and cheer thine heart," and all the brilliant costumes of the East mingle in the streets. Although Cairo contains a much larger population than Damascus, its bazars are by no means as extensive or imposing. These bazars are in long avenues, roofed over, and each is devoted to some special trade. There we find the silk, the saddler's, the tobacco, the coppersmith's, the bookseller's, the shoe and many other bazars, and now and then we come across an "antique Damascus blade" which was made last year in Germany.

While passing through the city on Friday, the great market day, I was attracted by Persians in gorgeous silks, Nubians in black and white, Greeks in their national costumes, Jews with long ringlets, Bedouins, Druses, Kurds, and Armenians mingling together, and lines of pilgrims on their way to Mecca—a marvelous medley of humanity, not to be seen, perhaps, elsewhere on the globe. The great mosque (there are over 200 smaller ones) exhibits three distinct styles of architecture, marking three epochs in the history of the place, and proclaiming the three dynasties that have successively possessed it. In the transept is a chapel said to contain the head of John the Baptist, which was found in the crypt of the church. The "street called Straight," which is interesting to all New Testament readers, is about a mile in length and runs across the city from west to east.

In round numbers the population is about 150,000, 100,000 of whom are Muslima. These are notorious for their fanaticism, which had a terrible proof in the massacre of July, 1860, when 6,000 Christians were slaughtered in the streets and 9,000 more in the district about the city. In this butchery we have a true picture of the "unspeakable" Turk when he is aroused. The churches and convents, which had been filled with the terror-stricken Christians, presented piles of corpses, and the thoroughfares were choked with the slain. Through the influence brought to bear upon the Turkish government the governor and three city officers were shot, 56 of the citizens were hanged, 117 received the death penalty, 400 were condemned to imprisonment and exile and the city was made to pay the sum of $1,000,000. Some refused at first to believe that the Turks were responsible for the massacre, but it has been shown beyond a doubt that they connived at it, they instigated it, they ordered it, they shared in it. Their conduct north of Damascus at present is a repetition of the same thing.

Besides the biblical allusions that have been made in this paper to Damascus, it will be remembered that Paul was converted on his way here, and that when the governor sought to apprehend him he was let down in a basket through a window and made good his escape, and that during his residence here "he preached Christ in the synagogue, that He is the Son of God, and confounded the Jews which dwelt at Damascus, proving that this is the very Christ." We are tempted to think that it would take more than the eloquent voice of a Paul to disturb the consummate indifference of the average pipe-smoking, coffee-drinking, sleepy-eyed citizen of modern Damascus.

Standing among the ruins of this inglorious city, you look upon the remains of two distinct but blended civilizations. The popular natural religions, which for centuries held Asia captive, mingle the wrecks of their colossal architecture with the exquisite forms that the artistic genius of Greece created. Camels, sheep, and goats graze on the grass which grows over the fallen crumbling columns and capitals, and the opening spring casts fresh green garlands over these relics of the dead past. Great columns lean heavily against tottering walls, as if determined to postpone their fall to the last moment, and over the scene of desolation the white chain of the Lebanon, capped by perpetual snow, gives a chilling look.

Here is the ancient Heliopolis of the Greeks and Romans, celebrated for its sun worship in the temple, which was one of the wonders of the world. Here you may witness how the pride and pomp of paganism arrayed itself before its death; here you see the ruin of an entire city, full of disorder, poetry, grandeur, and as you study some of this enormous debris in detail you find that nowhere is the Corinthian acanthus carved with more delicacy than on these gigantic blocks.

The temples of Baalbec, dating at least from the reign of Antonius Pius, were erected on the acropolis of the city, which was placed on an eminence, surrounded with gigantic walls, the stones of which belonged to that Phœnician architecture which has earned the name of Cyclopean.

First, there was the Great Temple of Jupiter, which has preserved a large part of its portico, its ornate architrave, its fluted columns, and a rich profusion of decoration; then there was the Temple of the Sun, the ruins of which clearly indicate its past grandeur, and the last was what was known as the Circular Temple, the only remains of which are a few highly decorated chapels. Passing through a long passageway, we enter a court, 70 yards long by about 85 wide, which is in the form of a hexagon, with here and there rectangular recesses in the wall, each with columns in front. From this hexagon originally a handsome portal led into the great court, about 150 yards long by 125 wide, in the center of which stood the basilica, while around were rectangular recesses, called by the Romans exedrae.

In front of this great court the principal temple of Baalbec stood. This temple had columns running round it, only six of which are now standing. These are 60 feet in height, with Corinthian capitals and bordered with a frieze. When the temple was in its glory there were 17 columns on either side of the temple and 10 at either end, 54 in all, the building inclosed by them being 290 feet long by 160 feet broad. The masses of broken columns and falling walls indicate not only the work of the "tooth of time," but the ruthless ravages of the Arabs, who have destroyed priceless treasures in art in order that they might secure the iron clamps in the columns. In the grand portico of the temple there is an inscription, which may be translated as follows: "To the great gods of Heliopolis. For the safety of the Lord Ant. Pius Aug. and of Julia Aug., the mother of our Lord of the Castra (here it is quite indistinct) Senate. A devoted (subject) of the sovereigns (caused) the capitals of the columns of Antoninus, whist in the air, (to be) embossed with gold at her own expense."

The second temple, or Temple of the Sun, stands on a platform lower than that of the Great Temple; 19 out of the 46 columns, each 65 feet high, remain, and the capitals and entablatures of the columns and the friezes round them are as exquisitely executed as anything in Baalbec. The portal of the temple claims one's special attention. The door posts are monoliths, most richly ornamented with foliage and genii; the architrave is of three stones, on the lower side of which is the figure of an eagle, the emblem of the sun, and the basement, which is 100 by 70 feet, is ornamented most profusely. Built into the outer wall are three stones, the largest ever used in architecture. The temple was at one time called Trilithon, or three stoned, probably from these stupendous blocks. One stone measures 64 feet long, another 63 feet 8 inches, and a third 63. Each is 13 feet high and 13 feet thick, and placed in the wall at a height of 20 feet above ground. It is still an unsolved problem how they were ever raised to their present position.

At the quarries in the Lebanon Mountains, where doubtless these stones came from, I examined an unfinished block which is 71 feet long and nearly 18 feet in thickness. The Circular Temple, which is located near to the modern village, is surrounded by Corinthian columns, is richly adorned by a frieze of flowers, and the entablature is heavily laden with elaborate decoration. As I sat upon an ornately sculptured parapet and, quietly and alone, studied this wilderness of magnificent ruins, where were displayed Phœnician glory and power, the poetry of Grecian art, and the pomp of Roman pride, the transitory character of even the most permanent and glorious of the material was pictured before me as never before.

The Chicago Academy of Sciences.

The Chicago Academy of Sciences is now in its thirty-ninth year of existence, and occupies a handsome fireproof structure in one of Chicago's most beautiful parks. Its museum contains about 50,000 specimens illustrating American natural history, and its library contains 7,000 works of reference in over a dozen different languages.

A free course of lectures by twenty-five professors will be given for four hours daily from the 15th of July to the 15th of August. The several subjects are: Anatomy, climatology, optics, geology, astronomy, physics of electricity, botany, zoology, entomology, comparative anatomy, mental science, biology, physiology, malacology, physical geography, surgical anatomy, physics of optics, bacteriology, ornithology, scientific nursing, language, Latin, German, anthropology, chemistry, surgical philosophy, medical chemistry, and hygiene and meteorology. Meteorology will be demonstrated at the auditorium tower every Saturday afternoon, from 2 to 4 o'clock, by Prof. E. B. Garriott. Those who are interested in such a course should address Dean J. J. Tobias, 115 Dearborn Street, Chicago.

AN International Congress of Hydrology, Climatology and Geology will be held at Clermont Ferrand, France, from September 28 to October 6. The minister of the interior of the republic has accepted the honorary presidency, and the government of the United States has been invited to appoint delegates.

Science Notes.

The University of Utrecht celebrated the twenty-sixth anniversary of its foundation on June 22 and the five following days.

A case of complete and immediate relief from the effects of ivy poisoning is reported in the Medical World by Dr. W. L. Shanks. His patient was swollen from head to foot, but in an hour after bathing in a solution of sodium hyposulphite was attending to business as if nothing had happened.

Science states that the extended use of small pilot balloons would result in giving us much valuable information as to the air currents in and around clouds. These balloons, which are cheap, reach considerable altitudes and are especially useful in indicating the drift of the air currents when there are no clouds in the sky, the direction of the lower currents when only the upper currents are visible, etc.

Observations made by M. Perrotin on Mount Mounier, at an elevation of about nine thousand feet above the sea, have convinced him that the period of the rotation of the planet Venus is equal to that of her revolution round the sun, the time of both being two hundred and twenty-five days or less. The observations were carried out in December of last year and in February, 1896.

Shillington (Montreal Medical Journal) reports the case of a man thirty years of age who was exposed to illuminating gas for about ten hours, and at the time he was found was profoundly asphyxiated. Artificial respiration, strychnine and the faradic brush were employed, which caused temporary improvement; but, the condition becoming worse, oxygen was employed, with immediate and slow improvement in all symptoms. In all about fifteen gallons were used in the course of eight hours. The reporters are firmly convinced that if this remedy had not been used, their patient would have died.

An account is given in the Physical Review by R. A. Millikan of some careful tests of light emitted by glowing solids and liquids, with a view to discover the laws of its polarization. This phenomenon is exhibited strongly by incandescent platinum, silver, gold, and by molten iron and bronze; a somewhat feebler polarization is shown by copper, brass, lead, zinc, and solid iron. The most significant result named is that polarization is minimum with rays emitted normally to the surface and maximum at a grazing emission, thus indicating that the vibrations take place in a plane at right angles to the emitting surface. Glass and porcelain also emit polarized light, but to a lesser amount; fluorescent bodies do the same, so that evidently a high temperature is not necessary; and in the case of uranium glass it is said to be the green reflected light which is polarized, and not the blue incident light diffused from the surface.

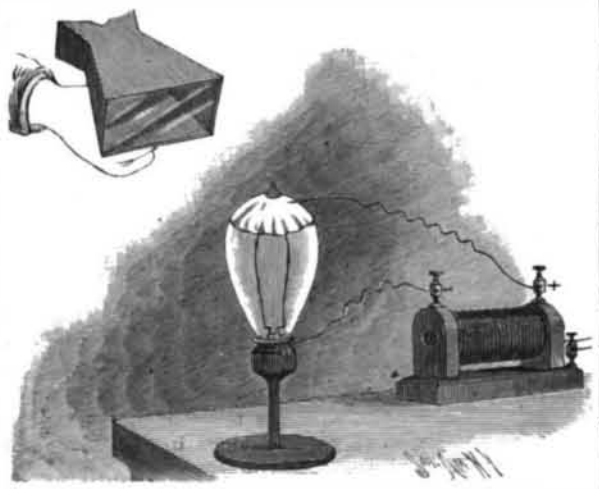
The first of the two annual conversaziones of the Royal Society was held on May 6, says Science. The exhibits included X ray photographs by Messrs. Swinton, Jackson and Sydney Rowland. Mr. F. E. Ives exhibited his method of color photography and Prof. Mendola gave a demonstration by means of the electric lantern of Prof. Lippmann's color photographs by the inferential method. Prof. Worthington showed photographs of the splashes produced by a falling drop of water taken with the electric spark, the exposure being less than three millionths of a second. A method was shown by which two or three thousand copies of a photograph can be printed, developed and fixed in an hour. The exhibits seem to have been largely in photography, but in addition Prof. Dewar repeated his experiments with liquid air, and the new binocular field glasses and stereo-telescopes of Mr. Carl Zeiss were exhibited.

Novak and Sulc have examined nearly 300 substances on the absorption of the Roentgen rays by chemical compounds. Their method of investigation consisted in attaching rings of glass to a sheet of paper and placing uniform layers of the finely pulverized materials in the different rings, so that the thickness of the layer was 0·4 cm. in each case. The paper with the rings was then placed over a photographic plate which was enveloped in black paper, and exposed to the Roentgen rays for a period of 20 to 25 minutes. By comparing the photographic effect of the rays where the substances were interposed, the relative absorptions were determined. The authors found, says the American Journal of Science, that a great number of organic compounds containing only carbon, hydrogen, oxygen and nitrogen are equably penetrable, and hence they conclude that the absorption has no relation to molecular weight or the arrangement of the atoms. Organic halogen derivatives were found to possess much greater absorption, which increased with the number of halogen atoms present. This effect increased with the atomic weights of the halogens, two atoms of bromine having a greater effect than six chlorine atoms, while iodine derivatives were entirely impenetrable under the conditions used in the experiments. This indication of the influence of elements of varying atomic weight led the authors to examine a series of elementary substances, all of rather low atomic weights.

INEXPENSIVE X RAY APPARATUS.

The expense of special Crookes tubes, powerful coils, and batteries has deterred many from entering this interesting field of experiment; but Mr. R. McNeil, of this city, has recently devised apparatus in which an ordinary incandescent lamp is substituted for the Crookes tube, and an induction coil of common form is made to supply electricity of sufficiently high potential to produce the X ray phenomena.

The lamp, which is a 52 volt, 16 candle power Sawyer-Man lamp, is made of German or lime glass. For convenience, it is mounted in an insulating standard. The top of the lamp is covered with aluminum



X RAY EXPERIMENT SIMPLIFIED.

foil, which is connected with one terminal of the secondary of the induction coil, and the bottom is connected with the other terminal of the secondary, as shown. The X ray proceeds from the cathode. By means of the fluoroscope the shadows of the bones of the hands and feet, also of the limbs, may be seen, when they are placed between the instrument and the lamp.

It has been found in this experiment that when a blue fog appears in the lamp, the vacuum is too low for the best results. By placing the lamp in the house circuit for fifteen or thirty minutes the high vacuum is restored by the heat and will remain good for about fifteen minutes.

The coil is capable of giving a three inch spark, and the X ray produced by this simple and inexpensive apparatus is sufficient for making radiographs.

THE DANCERS.

We present an illustration of one of the toys of the year. It consists of a nickel plated box some three inches in diameter. In the center of the top projects the end of a spindle, and at one side is a lever. To operate the toy this side projecting piece is pulled out,

THE DANCERS.

and one of the triangular pieces of tin to which paper figures are attached is placed in contact with the spindle in the top of the box. The dancers then begin a lively waltz on the top of the box. The secret of operation is not at first apparent, though it is evident that magnetism has something to do with it. On opening the box the mystery is solved. The spindle is of magnetized steel and extends through the top of the box, forming a slight projection. It turns freely and carries a pinion and a metal disk. The pinion is actuated by the projecting side piece through the medium of a toothed sector. Motion is transmitted to the triangular piece of tin carrying the dancers by the magnetized spindle causing a horizontal movement, giving it a movement around its own axis. Curved wires and a spiral, one side of which is colored, are also provided, and they all move around the pin at a lively rate, producing novel effects.

A Homeric Fight at Sea.

We were cruising in the Strait of Malacca, between the Nicobars and the Malay Peninsula, and had succeeded in killing a full-sized sperm whale. He had been a tough customer, needing all our energies to cope with him; but a well-directed bomb closed the negotiations just before sunset. As usual, he had ejected the contents of his stomach before dying, and we specially noticed the immense size of some of the masses floating about. By common consent they were about as large as our hatch-house, which measured 6×6×8 feet. I must very distinctly state that these masses were not square, but irregularly shaped masses, bitten or torn off in blocks from the body of some gigantic squid.

The whale was secured alongside, and all hands sent below for a good rest prior to commencing to "cut it" at daybreak. I had the watch from eight bells to midnight, and at about 11 P. M. was leaning over the lee rail, idly gazing seaward, where the rising moon was making a broad lane of silvery light upon the smooth, dark waters. Presently there was a commotion in the sea, right in the way of the moon, and I immediately went for the night glasses to ascertain, if possible, the nature of it. In that neighborhood there are several active volcanoes, and at first I judged the present disturbance to be one of these, sending up debris from the sea bed. A very short examination satisfied me that the trouble, whatever it might be, was not of volcanic or seismic origin. I called the captain, as in duty bound, but he was indisposed to turn out for anything short of actual danger; so the watch and I had the sight to ourselves. We edged away a little under the light draught of wind, so as to draw nearer to the scene, and presently were able to realize its full significance. A very large sperm whale was engaged in deadly conflict with a monstrous squid, whose far-reaching tentacles enveloped the whale's whole body.

The livid whiteness of those writhing arms, which enlaced the cachelot like a nest of mighty serpents, stood out in bold relief against the black bowlderlike head of the aggressor. Presently the whale raised itself half out of the water, and we plainly saw the awful-looking head of the gigantic mollusk. At our distance, something under a mile, it appeared about the size of one of our largest oil casks, which held 336 gallons. Like the rest of the calmar visible, it was of a peculiar dead white, and in it gleamed two eyes of inky blackness, about a foot in diameter.

To describe the wonderful contortions of those two monsters, locked in a deadly embrace, is far beyond my powers, but it was a never-to-be-forgotten sight. The utter absence of all sound, for we were not near enough to hear the turmoil of the troubled sea, was not the least remarkable feature of this Titanic encounter. All around the combatants, too, were either smaller whales or immense sharks, who were evidently assisting in the destruction of the great squid, and getting a full share of the feast. As we looked spellbound we saw the writhings gradually cease and the encircling tentacles gradually slip off the whale's body, which seemed to float unusually high. At last all was over, and the whole commotion had completely subsided, leaving no trace behind but an intensely strong odor as of a rocky coast at low tide in the full blaze of the sun. Since that night I have never had a doubt either as to the origin of all sea serpent stories or the authenticity of the old Norse legends of the kraken; for who could blame a seaman witnessing such a sight, and all unaccustomed to the close observation of whales, for reporting some fearsome monster with horrent mane and floating "many a rood"?—Nature.

IT is well known that the bones are relatively opaque to the X rays, and that this opacity is due to the chemical composition of the fundamental bony tissues, which are made up of calcium salts (phosphates, carbonates, and fluorides). The question would then be a natural one, whether, by introducing a salt of lime into the veins, they could be made to leave a shadow on the photographic plate. The Physical Institute at Rome has performed this experiment. Into the brachial artery of a dead body was injected a paste of sulphate of lime, sufficiently liquid to penetrate all the blood vessels, and then, after it had hardened, the hand was photographed, the Crookes tube being held at a great distance, so that the shadows would be very sharp.—Cosmos, Paris.

AN American firm has obtained a concession to build a railroad between Seoul and Chemulpo, in Corea, a distance of 30 miles.