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Contents.

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TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 931.

For the Week Ending November 4, 1893.

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CLOSING OF THE WORLD'S COLUMBIAN EXPOSITION.

When our readers shall have received this paper the Chicago exhibition will be no more. After months of debate, after suggestions as to the city where it should be held, after criticisms and congratulations innumerable following the decision as to site, Chicago may justly claim to have honored herself and the United States by her achievements. In a time unprecedentedly limited when compared to the work to be done, the buildings were erected and the Fair was opened at the appointed date. From the sea of mud, as the ground was described in its early winter and spring days, the lovely Jackson Park, with its beautiful landscape and floral features and its Venice-like lagoons, blossomed into being. The great buildings rose in their places, the fountains and statuary were installed, and the White City appropriately graced its surroundings.

In many ways the Fair was an innovation. The combination of landscape and waterscape was new. The great area occupied necessitated adequate means of transportation within the grounds. The buildings, too, were so large as to make it hard to see them satisfactorily. Accordingly the waters of the lake were utilized, and the water transportation within the grounds became one of the features. Bringing old and new together, gondolas from Venice competed with electric launches in this service.

The Fair grounds and buildings were not merely a receptacle for exhibits. By the efforts of the best architects and artists of our nation the buildings and statuary became the best exhibit. Unsurpassed by man when their size is considered, the great buildings have received numerous encomiums from all critics from the art standpoint. The statuary on them and distributed through the grounds was another feature of great attractiveness. Thus having provided a true world's pleasure ground, Chicago drew upon the treasures of the globe for its adornment with exhibits. But, in the opinion of many, the work of Chicago (the grounds and buildings) surpassed their contents (the exhibits). This marked a recent innovation, for the artistic side has usually been esteemed as of secondary importance in the buildings and grounds of World's Fairs. Paris, in 1889, set an example which Chicago, in 1893, followed to its proper conclusion.

The system of concessions, as carried out upon the Midway Plaisance, introduced the spectacular element, but of a character of real value. Never before had the different nations of the world had so impressive a showing—no such practical lessons in anthropology have ever been given. The attendance at the Fair has been one of its wonders. A thousand miles from the seaboard, its situation seemed to militate against it. But thirty-seven railroads, with over seventy-six thousand miles of track, center in Chicago. Without a change of cars, almost any inhabitant of the continent could reach the Fair on some of these lines.

At World's Fairs it has become the custom to have days devoted to or in honor of special occasions, States, cities, or countries. These are signalized usually by a greater attendance than usual. At Chicago we find a record of 128,965 paid admissions on opening day, 283,273 on the Fourth of July, 160,382 on New York day and 243,951 on Illinois day. These records appear small if contrasted with the October attendance, when the daily visitors varied from 128,196 on October 2 to the magnificent and unprecedented number of 716,881 on October 9, Chicago day. As the Fair was reaching its close, the city of New York felt that it should congratulate its sister, and on October 21 Manhattan day was celebrated. The mayor of New York and other representative dignitaries visited Chicago and participated in the ceremonies of the occasion. The attendance was 298,928.

These attendances may be contrasted with Paris and Philadelphia. The greatest day's attendance at the Philadelphia Exposition of 1876 was 217,526; at the Paris Exposition of 1889, it was 397,150. Thus Chicago on her own day almost doubled the Paris and almost trebled the Philadelphia figures.

The total attendance of some twenty-one millions is, however, inferior to that of the Paris Fair of 1889, where 28,149,353 visitors were recorded, although the Chicago Fair occupied six times the area of ground and had five times the area roofed compared with this Exposition. The visitors increased in number as month after month passed by. In May 1,050,037 are recorded. This was at the time a great disappointment. But when June showed 2,675,113, expectations began to be brighter, and the succeeding months showed 2,760,263 for July, 3,515,493 for August, 4,659,871 for September, and about seven millions for October. Thus the entire attendance for the opening month was almost the same as that of two days in October—Chicago and Manhattan days. If Chicago were a little further south and if its Fair had another month of life, the attendance would probably reach thirty millions.

And now it passes into history as one of the world's wonders, as one of man's greatest achievements, something that the present generation can hardly hope to see equaled.

COALING CRUISERS AT SEA.

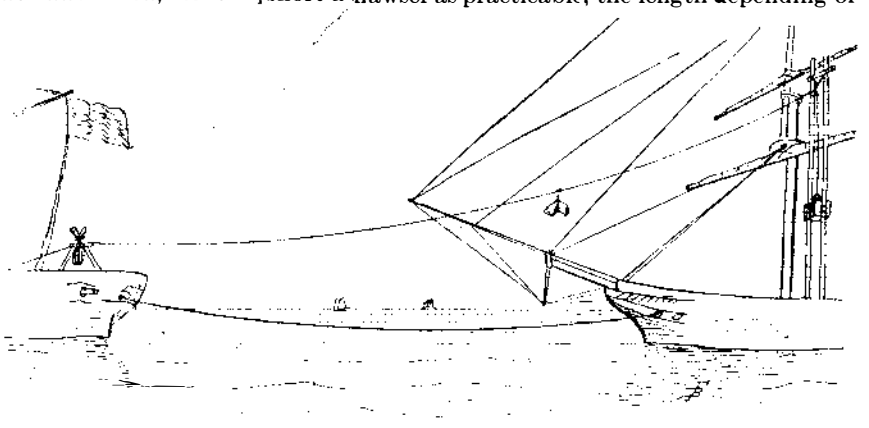
During the war of the rebellion we kept a large fleet of vessels on blockading duty. They were often obliged to keep the sea for long periods of time, especially off the Carolina coasts, and the question of methods of supplying them with provisions and coal was one which engaged the earnest thought of the Navy Department and naval officers in general.

Provision transports were sent from Northern ports, and though usually successful in delivering their freight to the blockading fleet, yet occasionally they met with disaster and frequently with delay. The principal difficulty was in transferring the coal, the motions of the two ships, even in a small sea, rendering the operation difficult and dangerous.

A solution of the problem of coaling ships at sea has been sought ever since, and many devices have been brought forth by inventors both in and outside of the navy. The solution is particularly valuable to the United States in view of the fact that we have no coaling stations. In case of foreign naval operations we would be obliged to send colliers, and our cruisers would probably have to take the coal from them while at sea or outside of the marine league.

Recently the Navy Department ordered two of the North Atlantic fleet to be equipped and rigged to try the experiment of coaling at sea after a new plan. The ships detailed for this purpose were the flagship San Francisco, which represented the cruiser, and th United States steamer Kearsarge, which played th part of collier.

The plan is for the cruiser to tow the collier with a short a hawser as practicable, the length depending on the state of the sea. The smoother the sea the shorter the tow line. In order that there shall be as little jump to the ships as possible, the cruiser steams ahead very slowly, barely having steerage way.



COALING VESSELS AT SEA.

A jackstay is rigged between the two ships, the higher end being on the collier and the coal in bags, suspended from trolley wheels which hang on the jackstay, runs by force of gravity from the collier to the cruiser. The jackstay consists of a steel wire rope about three-quarters of one inch in diameter. It must be kept properly taut and yet must get no undue strain either from towing or from the plunging of the ships. This is accomplished by using a counterpoise.

The experiment was tried on the 18th of October, off Sandy Hook.

The ships were rigged as follows: On the after part of the cruiser was erected a small derrick or shears about ten feet high, composed of two short spars lashed together at the heads and firmly secured at the heels, on the deck. A cross piece was lashed near the top of the shears and from this cross piece was hung a number of fakes of rope cable to act as a buffer for the bags of coal. Over the cross piece ran the jackstay, one forward end being firmly fastened to the deck near the mizzen mast.

On the forward part of the collier were erected two upright poles to act as guides for the counterpoise. The upper ends of these poles were lashed to the foretopsail yard, the heels being firmly secured to a shoe on the forecastle deck.

The poles were parallel and about four and a half feet apart. A cross piece was lashed near the heads, and from a bridle from this cross piece was suspended a large iron sheave or gin block. Between the poles was arranged a cubical box with guide irons surrounding the poles. The box was also fitted with an automatic lever, spring and eccentric clutches to prevent the box dropping to the deck in case of accidental parting of the jackstay. The contrivance was similar to that used on elevators in buildings. The box weighted with sand formed the counterpoise.

The steel wire rope jackstay was made fast to the counterpoise box, then passed up and over the gin block at the head of the poles, and thence to the

cruiser over the cross piece on the shears, and the end secure on the deck, as before mentioned. Sufficient strain was put on the jackstay to hoist the counterpoise box about half way up the poles. As the ships roll and pitch, the counterpoise box slides up and down between the poles, keeping a constant and even stress on the jackstay.

Both the shears on the cruiser and the poles on the collier were firmly held in place by rope guys and stays. The coal, in sacks is hoisted by a special tackle on board the collier up to the top of the poles, where it is hooked to a small trolley wheel, which is placed on the jackstay. When released, the weight of the coal causes the trolley wheel to run down the inclined jackstay to the cruiser. Just before it arrives at the shears, a tripping device throws the trolley off the jackstay, and the sack of coal falls to the deck, its forward motion being checked by the buffer made of hawser loops.

The distance between the ships, or rather the distance from the shears on the cruiser to the upright poles on the collier, was about two hundred and thirty-five feet. The height of the gin block above the cross bar of the shears was about thirty-two feet. The inclination of the jackstay to the horizontal was about seven degrees and fifty minutes. The total weight of the counterpoise box and its load of sand was about sixteen hundred pounds. The weight of the bags of coal was nearly two hundred pounds. The time of travelfrom pole head to shear head was about fourteen seconds. The full time of hoisting and sending over ten bags was about twenty-one minutes. This gives a rate of delivery of about two and two-thirds tons per hour.

All parts of the apparatus worked well, but as the sea was calm, it was impossible to tell what would be the result in even a moderate sea. In a rough sea the distance between the ships would have to be increased, and there must be a corresponding increase in the height of the gin block in order that the proper inclination shall be given to the jackstay.

Although there is doubt about the apparatus working properly in a seaway, yet the most important defect is the slowness of delivering coal. On a properly and specially equipped collier, this no doubt would be bettered by the use of steam winch in hoisting the coal, instead of hoisting by hand, as was done in the experiment. There would also be used two jackstays, one on each side, running from either bow of the collier to the quarters of the cruiser.

Whether this device, with such improvements as may from time to time be suggested by experiments, is the one to be adopted for coaling at sea or not, remains to be decided by our brainy readers.

Any one who will devise a method of rapidly and safely coaling our cruisers at sea will add to the navy's efficiency and, no doubt, will receive an abundant reward in dollars from the government. BRAINARD.

Approaching Completion of the Manchester Ship Canal.

The deputy chairman of the company recently informed the Manchester Corporation that there was every probability of a waterway being opened for ships to the docks and wharves of the city on the first of January, and he quoted a letter written by the dredging master promising a minimum depth of 23 feet of water throughout the canal by that date. As an earnest of the fulfillment of this, we hear, says the *Engineer*, that a steamer reached Runcorn by the canal last week, which proves that the work of construction in the estuary is finished. This, from an engineering point of view, was the most harzardous and difficult portion. We congratulate the engineers on bringing it to a successful termination. On board the steamer were several of the directors of the Peninsular and Oriental Steamship Company, but with what object they paid the visit has not transpired. Manchester goods form a considerable portion of the tonnage carried through the Suez Canal, and at a public meeting in Manchester eight years ago, Monsieur De Lesseps told his audience that in his opinion the Suez Canal ended in Manchester. No doubt a direct trade will be done between Manchester and Bombay, and it is probable that the Peninsular and Oriental line will be early in the field. It is not six years since the first sod was cut at Eastham. The amount of work accomplished since then is astonishing; and when we consider the opposition that has been encountered from such powerful bodies as the Mersey Dock and Harbor Board and the railway companies as well as the elements, it is surprising to find the canal is so nearly finished. The weather has favored the contractors of late, as it did at the commencement of the work.

THE depth to which the sun's rays penetrate water has been recently determined by the aid of photography. It has been found that a depth of 553 feet the darkness was to all intents and purposes the same as that on a clear but moonless night. Sensitized plates exposed at this depth for a considerable length of time gave no evidence of ligh

Russian Exhibits.—Russia's projected government house was never completed, but her pavilion in the Manufactures building is so spacious that it serves the purpose in considerable measure.

One corner of this pavilion, which fronts upon the main avenue of the building, is in the form of a Russian church with green roof, bulb shaped tower, colored windows and religious pictures. At each side of the broad entrance to the pavilion, and in its center, stands a massive rhodonite vase. They are so tall as to be suitable ornaments in this largest of buildings, and are as beautiful in form as they are rich in color.

When, at last, one turns away from these, it is to notice on the right a curious and beautiful piece of furniture, a bookcase and cabinet combined, decorated with burnt work by Madame Semetchine, of St. Petersburg. The doors and panels are ornamented with portraits of Tolstoi and scenes from his life. The portraits represent him at different ages; the other pictures show him plowing in a field, writing in a plain room, and engaged in other avocations. The delicacy and finish of this burnt work is not excelled by that produced by a brush. One cannot but admire a woman bright enough to give us Americans an epitome of the life of her one countryman whose name is somewhat familiar even among the masses of our people, and in a form to attract universal attention.

Close at hand are the bronzes shown by the St. Petersburg firm of Stange. They are made from models left by the great sculptor Eugenius Lanceray, a Russian of French extraction, who died in 1885, at the age of thirty-seven. Of art training he had only what an amateur can get in the studios and galleries of Paris; but wandering in the Caucasus and the Crimea, and along the steppes inhabited by the Bashkirs and Kirghizes, he studied national life until he could represent it in enduring form.

Horsemen and horses are his subjects, and the figures are small—about the size of Barye's. They are all full of action; none is more spirited than that of Sviastoslaw. His head is bare, he sits his horse as if forgetful of it, and with sword in hand is arranging his troops; his expression is so animated that one almost sees the men falling into position before that commanding presence.

Among the most striking groups is that called "After the Battle;" his last and largest group, composed of graceful, dashing horses, is named "An Arab Fantasie." Many of these bronzes have been sold; the remaining ones are to be brought to New York when the Fair closes.

Near by there are many other little bronzes by other sculptors, whose names I could not learn. They are charming pictures of peasant life, but none are so fine as Lanceray's. The Russians show wonderful aptitude for this miniature work. Further evidence is given in a case which one might easily pass unnoticed, and yet which is full of interest. It contains quaint little figures, six or eight inches high, in the various occupations and positions which peasant every-day life affords; they are dressed in costumes barbaric in color and clumsy in form, but every pose is perfectly natural. The little people are made of *bread* by a lady in St. Petersburg. The notice under them is one of the numerous examples of curious English which one sees. Here it is: "I beg to considerer for my articles only those that have my initiales on the backside."

Close to the Lanceray bronzes is a large case containing very heavy fabrics, rich in texture and color, made in Moscow from silk cocoons grown in Southern Russia. The silk is wound on an Atwood machine made in Stonington, Ct.

For specimens of painstaking, patient work, nothing in the department equals the three "imperial appanages." They would be called cabinets in our language. They are made of highly finished light wood, have gilt decoration and marble tops, but their chief beauty is in the doors, which make the entire front of the upper part of the cabinet. These doors are mosaics of bits of marble almost microscopic in size and so perfectly matched that only the closest scrutiny shows how they are made. Italian mosaics which I have seen are coarse in comparison. One pair of doors represents a scene which might have been taken from an Amazon forest, as very likely it was. There is a mass of tropical plants, with birds and monkeys among them; the effect of a soft, hazy atmosphere is perfect; the touches of brilliant color in a bird's wing or a stray leaf add to the delightful picture. The base of this cabinet, as well as the ornamentation below the door, are also of mosaic, and upon the whole 14,558 days' work was spent. The mosaics of the other two "appanages" are very rich in color, but have a less elaborate design; they are simply birds of beautiful plumage upon a background of lapis-lazuli from the stone works at Petershof.

Close at hand are bowls cut from jades of a light shade, wonderful for size and finish. A very rich labradorite table and pedestals must be most tempting to people who can surround themselves with objects of enduring beauty. They are less showy than the superb malachite and gold tables which stand near them.

A significant gift shown among the work of the silversmiths is a magnificent dish in silver and gold given by the Cossacks of the Urals to the Czarewich. The perfection of workmanship which is attainable in the handling of these metals is shown in a gold salver with a silver napkin lying upon it, so exact an imitation of linen that one can hardly believe it to be an imitation.

The exhibit of the Imperial State Paper Manufactory is worth careful examination. It is the outgrowth of the use of paper money in the empire, begun about a century ago. The first bank notes were made in a little mill near St. Petersburg; but in 1818 the institution which has since grown to great proportions was founded. Its product is now taken both by the government and private concerns. In 1860 new buildings were finished and equipped with English machinery for the manufacture of paper, and with German printing presses, the buildings and plant costing two and a half million dollars.

The Minister of Finance appoints the director, who is at the head of the business, and the number of officials under him is regulated by law. The proceeds of the business, after expenses are paid, are divided equally between the government treasury and the employes. The manufactory also furnishes for their employes and their families 373 dwellings, a dining hall for 350, an elementary school, a chapel, a hospital with 30 beds, and physicians and attendants. The great establishment is on Fontanka Quay in St. Petersburg.

The pavilion in which its exhibit is placed is of Circassian nutwood, ornamented with panels of polished platane. This, as well as all the frames and showcases, were designed and made in the cabinet making department of the manufactory. The paper is made entirely of hemp and rags, hemp being the chief constituent of that used for bank notes. Specimens of the products shown are water-marked, hand-made, and machine-made in sheets, and the continuous web made by machine. The bank note paper has a silk net in the middle of the sheet, which is put into the pulp, and twenty-five looms are in use weaving this net.

The printing done in the establishment is illustrated in the form of these bank notes, postage and other stamps, bonds, drafts, etc. By means of a machine invented in 1891 by Mr. Orloff, an engineer in the works, colored figure printing from *cliches in relievo* is done. "This system of figured printing renders it possible to obtain various patterns and designs in many colors, gradually passing from one tint to another, from one stereotype and at one impression." (Statement made in pamphlet about the works, found in the exhibit.) The establishment makes all its own type and in the last two years has replaced much of the old by type made from original designs.

The display of copper and iron electrotypes includes a wide range of subjects; among them are Alexander the Great, a bass-relief from a marble in the Imperial Hermitage; Copernicus, a bass-relief in wax by Krynsky; shields, helmets, swords, and daggers of ancient and sometimes unknown origin, but elaborate in design; heads of Michel Angelo, Catherine II, M. Jacobi, the inventor of the electrotype process, and many others. The bust of J. N. Niepce and that of the Empress Marie Feodorovna are iron electrotypes without seams. The different photo-mechanical processes, heliogravure, photo-zincography, photo-relief, photo-lithography, and collotype are all illustrated by most interesting examples. The helio-engravings, nine in number, from originals by Chemesoff, Soutman, Vyscher and five other artists, executed by a special process discovered in the manufactory, are in the most prominent place on one of the sides of the pavilion. They are remarkable for their clearness and beauty.

In no section of the Fair did I see so much to indicate that large sales were being made as in the fur room of the Russian pavilion. The assortment was extensive: mink, sable, seal, and the less costly skins were all displayed to fine advantage, and women in stylish toilets found them fascinating when the mercury hovered among the nineties. They had the same air of business as had the lady who was inquiring the prices of the engravings in the Art Gallery and selecting certain ones because "they furnish more than large pictures."

(To be continued.)