Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 361 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year, postage included..... $3 20
One copy, six months, postage included..... 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each; additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies, 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 361 Broadway, corner of Franklin Street, New York.

NEW YORK, SATURDAY, JUNE 27, 1885.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT,

No. 495,

For the Week Ending June 27, 1885.

Price 10 cents. For sale by all newsdealers.

ARRIVAL OF THE STATUE OF LIBERTY.

The French man-of-war Isere, bringing the famous gift of the French people to America, Bartholdi's Statue of Liberty, came to anchor in the Horseshoe, off Sandy Hook, early on the morning of the 17th. The weather was so foggy that she was not recognized until after crossing the bar, when she displayed her private signal, and the welcome news that the Isere had arrived was immediately telegraphed to the city.

General Stone, under whose direction the pedestal on Bedloe's Island is being constructed, was on his way to the works when the news came. He at once telegraphed an enthusiastic welcome to Captain De Saune, commander of the Isere, and prepared to visit the vessel. He was accompanied by President Sanger, of the Board of Aldermen, and Louis de Bebian, the agent of the French line of steamers. The William Fletcher took the party down the bay, and was soon alongside of the Isere. Headed by General Stone they went on board, and were given a cordial reception by Captain De Saune. The Isere, a bark-rigged vessel of 1,000 tons, had encountered heavy seas and roughweather during the first part of her voyage. Counting the two days spent in coaling at Fayal, in the Azores, she had been 27 days in making the passage. Captain De Saune presented General Stone with the official transfer of the statue from the French Committee to the American. It is handsomely engrossed on parchment, and bears the seal of the French Republic. It is decorated with a picture of the statue and pedestal, and, very appropriately, with the heads of Washington and Lafayette. Later in the day, Captain Selfridge, of the U. S. man-of-war Omaha, delegated a lieutenant to present his compliments to the French commander, and suggest that Gravesend Bay would afford a safer anchorage than the Horseshoe. The Isere accordingly changed her position during the afternoon.

Admiral Lacombe, with the French flagship La Flore, which had been in waiting at Newport, joined the Isere on the following morning. During the succeeding day many informal visits were paid to the French officers of both vessels, Commander Chandler and his staff of the Brooklyn Navy Yard being among the number. The official welcome did not occur until the 19th. The Reception Committee, composed of the Mayor, Aldermen, American Committee, and Committee of the Chamber of Finance, on board the new ferry boat Atlantic, left the pier at nine o'clock, and proceeded down the harbor to Gravesend Bay. They were received on board the Isere by Captain De Saune, to whom they delivered their message of welcome and tendered the hospitality of the city. The Committee then returned to their own steamer, and took their place in the naval procession then forming. This was headed by Commodore Chandler in the flagship Dispatch. He was followed by the Powhatan and the Omaha. The French flagship La Flore came next, thundering a continuous salute in answer to the surrounding forts. Immediately in her rear came the object of all this demonstration, the Isere and her precious burden. The Atlantic and a numerous retinue of gayly decorated craft completed the procession. At Bedloe's Island the French officers and the Pedestal Committee landed and inspected the work, while the "Marseillaise" and "Hail Columbia" were given by the French choral societies.

A reception was then tendered to the French officials at the City Hall, followed by a banquet at the Chamber of the Board of Aldermen. The statue is packed in the hold of the Isere in pieces ranging in weight from 150 pounds to 4 tons, each piece being well protected in a wooden casing. They will be stored in a building erected for the purpose on Bedloe's Island, where they will be quite safe from too inquisitive visitors.

The magnificent day, the enthusiastic crowds, and the fine display of the tricolor and the stars and stripes made a pageant which will long be remembered in both the history of New York and of the United States.

JAPAN AT THE NEW ORLEANS EXPOSITION.

It is rather curious to note that of all the countries represented at the Exposition, our far Eastern friends, China and Japan, have presented the most careful catalogues of their exhibits. China has evidently thought that a cotton centennial meant cotton, and accordingly has sent nothing else; but in its way, it is one of the best things at the Exposition. Japan has read her invitation in a somewhat broader sense, and sends a more general display. The government is naturally the chief exhibitor, and has made a prominent feature of the educational display, which is very interesting, and shows a decided infusion of Western ideas. It sends, in addition, much of interest in the way of agricultural and industrial exhibits. Several private firms are also well represented, principally in the ceramic and art metal works department. The Japanese Commissioners have issued an admirable catalogue, giving a well systematized list of the exhibits, and have also added much interesting information in regard to that but little known empire. It contains many curious facts and much curious English.

It will be a surprise to many who are accustomed to think of Japan as a rather insignificant group of islands dotting the map to the east of the Chinese coast, that she contains, nevertheless, about 37,000,000 people, scattered over the four principal islands—Hondo, Kiushiu, Shikoku, and Yesso—and the hundred and seven smaller ones.

Agriculture, "a root of the country," as they call it, is much esteemed in Japan, and claims the services of two-thirds of her population. But the account of its condition and progress reads rather strangely to an American, accustomed as he is to thousand-acre grain fields and elaborate labor-saving machinery. As the entire empire contains but a little over 11,000,000 acres of arable land, and as it is self-food-producing, it will easily be understood that very careful husbandry is required to support three people from the produce of one acre; it is a problem we should hardly like to undertake in America. In consequence of these conditions, and the very cheap labor, the culture is nearly all by hand, an enlarged system of gardening, in which different crops are sown in alternate rows, so that while one is being harvested, another is maturing. Even wheat is treated in this way, and grows alongside of the upland rice. The culture of tea and silk, requiring such constant care and so many hands, gives employment to large numbers of women and children. With so many mouths to feed, and so little land, comparatively, to feed them from, but a small area can be afforded for live stock. In the entire empire, the horses and cattle together, according to the statement of the Commissioners, number less than 3,000,000, while sheep, which were only introduced ten years ago by the government, still count only a few thousand. Poultry, indeed, may be said to be the only abundant animals, and are found on every farm.

Japan has borrowed much from China, and notably from Corea, sharing with her that excessive love for landscape gardening and horticulture, so that every house, no matter how small, has something of a garden, with its miniature roads, ponds, and fantastic rock work.

Considerable attention has also, of necessity, been devoted to forestry, for, with very few exceptions, the houses are all built of timber, and wood is the general fuel. So long ago as the ninth century forest laws were in existence, and for the last three or four hundred years have been quite strictly enforced in several of the provinces.

The industries represented at the Exposition are chiefly in artistic lines. For many years the peculiar merits of Japanese art have been very generally recognized, and the *chef d'œuvre* of many a choice collection has come from the skilled and painstaking hands of a Japanese workman. We have undergone in this country what we have denominated as the Japanese "craze;" and though so many of our imitators have reproduced only the grotesque in that characteristic art, and have utterly lost its real beauties, the movement, as a whole, has been a benefit, for of all schools there is probably none truer and more realistic than the Japanese. As a nation, these quiet, almond-eyed people are both artists and workmen. They seem endowed by nature with an artistic temperament, and to combine with a strong love for the beautiful the nice eye and cunning hand to give their conceptions just realization. Their artists possess in a marked degree the power of producing the most realistic atmospheric effects, of indicating unmistakably the season of the year, the hour of the day, and the state of the weather—a power at once so rare and so essential to good results, that it is often the main criterion by which we judge our modern landscape painters. It is the common fault of chromos that they have no atmosphere.

The bronze industry in Japan is one of very ancient origin, and one of prominent rank. A huge statue of Buddha, fifty feet in height, was erected in the eighth century, and since then the course of the art has been continuously progressive. The product is usually denominated by its color, or by the maker's name; thus the green bronze is *seido*, and the black *udo*. In combination with the castings, the finest effects are produced by the delicate repousse work on the precious metals or the copper alloys. In the inlaid work, a great variety of material is brought into requisition by the workman: iron, copper, gold, silver, brass, pearl, ivory, all are combined into forms of wonderful beauty. The Japanese cloisonné has long been celebrated, and is still much sought after. It may be described as a mosaic of porcelain enamels on a foundation of copper. Of late years, a cheaper variety has come into vogue, in which the foundation is of pottery, and the cloisonné effect produced by the copper tracery on the surface, separating the different colored enamels, but, while very popular, it does not of course equal the genuine article.

Pottery is another very ancient art, and one in which great proficiency has been obtained. The product best known in this country is probably the "Sometsuki," or porcelain decorated with blue painting underneath the glaze, the color being obtained from a native cobaltiferous ore, or from a purer article imported from China. Several localities possess old established works, most of them directly traceable to Corean workmen, and their wares have

a distinctive character. The Kaga ware is deservedly popular, and is characterized by the fine gold ornamentation on red or black ground, where open fields are left, decorated with flowers, birds, and people. The Japanese faience, the Satsuma ware, is another favorably known product.

The paper making industry, introduced from Corea in the sixth century, has sent its product in the shape of screens, panels, fans, parasols, and the like over the entire civilized world. It is characterized by its vivid coloring.

But of all these decorative industries, the Japanese lacquer ware is the most celebrated and the most distinctively national, if any distinction can be made where all products are so markedly characteristic. Its quality and beauty are recognized the world over. The lacquer is made from the sap of the *Rhus vernicifera*, a tree cultivated particularly for this product. The lacquer urushi, obtained from incisions made in the tree, is a dirty gray viscous liquid, which is refined by straining and decantation. It is a peculiarity of the process that it is absolutely necessary for the lacquered articles to be dried in a damp atmosphere, or they will not possess the requisite hardness. The Board of Industry have made a large exhibit in this department, in view of its distinctively national character.

The industries of Japan possess a particular interest to foreigners, on account of the unique materials employed and the dignity which old age bestows. At a time when England as a nation did not exist, when the progressive peoples of modern Europe were to the polite world as barbarians and strangers, these ancient people were patiently at work, by slow degrees perfecting the details of their art, until now they produce wares without a rival in the markets of the world, and to a large extent not capable of imitation elsewhere. The origin of most of these industries, as has been seen, can be traced back to China or to Corea, but they have been so modified in the hands of the Japanese artisan that they now possess an eminently national character. Like the agriculture, the work is most entirely by hand. There are but few workshops of any size, most of the manufacturing being done on small scale or even in the homes of the workmen. In a number of the industries, however, the division of labor has been carried out to a large extent. A peculiar feature of the social organization of Japanese manufactures is the descent of a trade from father to son. In the crystal factories this is particularly the case, and men there are doing exactly what their grandfathers did, only doing it a little better. And it is quite possible that their peculiar skill is due in a large measure to heredity, each generation making some little progress, and transmitting its accumulated acquisitions to the next.

A New Application of Electricity.

A new and interesting application of electricity, in a somewhat unexpected direction, has formed the subject of some recent investigations by Mr. Alfred O. Walker, of Chester, Eng.

Our readers may have noticed, the autumn of last year, says *Engineering*, reports of a lecture read by Professor Lodge, of Liverpool, on the subject of "Dust." Papers were first read by Professor Lodge* in this country, and the subject was afterward more extensively dealt with in a lecture which he delivered at Montreal, during the meeting of the British Association.

In the course of these lectures the Professor brought before his hearers the curious observations which he had made as to the effect of a discharge of high-tension electricity from a point, or points, into glass jars or other vessels containing dust of any kind in suspension. He also made interesting and striking experiments illustrating his remarks. Thus if a bell-jar be filled with a dense smoke of magnesia, by burning some magnesium wire inside it, a very long time elapses before the magnesia settles out and leaves the glass clear of smoke. But if a metallic point be introduced into the jar, connected by a wire to one of the poles of a good frictional, or induction, electric machine, it is only necessary to set the machine to work, and almost instantly an extraordinary effect is observed inside the bell-jar. The magnesia smoke commences to whirl about, and then forms itself into large flakes and strings, which rapidly settle on the bottom and sides, leaving the jar perfectly clear of smoke. What would have taken several hours to settle in the ordinary course, is completely cleared and deposited in a few seconds. The same effect is produced if the jar is filled with any kind of smoke, that from thick paper, or from a cigar, being acted upon exactly in the same manner as the magnesia. Professor Lodge told his audience that he and his assistant had made experiments on a very much larger scale than those in the glass jars. Rooms had been filled with dense smoke and rapidly cleared in the above manner.

A report of one of these lectures appeared in our contemporary *Nature*, and was read by Mr. A. O. Walker. This gentleman is one of the partners in the well known firm of Walker, Parker & Co., lead smelters and manufacturers, and it at once struck him that in these observations and experiments of Professor Lodge might be contained the means of solving one of the principal problems with which a lead smelter has to deal, viz., the condensation of the "fume," or volatilized lead, from the furnaces. Various forms of apparatus have been from time to time proposed as "fume condensers," but with little or no success, the best results being so far obtained by passing the fumes from the furnaces through long flues and chambers. At the large works belonging to Walker, Parker & Co., at Bagillt, in North Wales, the flues and chambers have a total length of over two miles, and still the condensation and deposition of the lead fume is far from complete.

Mr. Walker at once communicated with Professor Lodge on the subject, and the matter being considered very promising, it was decided at once to try experiments on a practical scale. These were carried out by Mr. Walker at the works at Bagillt, with the assistance of the manager, Mr. W. M. Hutchings. Professor Lodge himself gave scientific advice and assistance on special points. The results of the experiments, which were carried on during many weeks, were extremely satisfactory, and fully bore out Mr. Walker's hopes and expectations.

By means of large casks a wooden flue was constructed at right angles to one of the main flues of the works, and with a damper on the main flue it was possible to make any required amount of the fumes from a group of furnaces pass into and through the wooden experimental flue. This latter was provided with glass windows placed opposite one another for the purpose of observation. It also had dampers by means of which it could be filled with the furnace fumes and then closed at both ends, so that it formed a chamber representing the Professor's bell-jars on a very large scale.

The electric machine employed was on the Voss system, the glass disk being 18 inches in diameter. It was worked in a small shed erected close to the experimental flue. One pole of the machine being connected with the ground, the other was connected to an arrangement of metallic points placed inside the flue, and exactly between two of the windows above mentioned. A well insulated copper wire led from the pole to the top of a stout brass rod, which was fixed in the top of the flue, projecting some distance above it, and reaching so far into it as was necessary to sustain the discharge points in the desired position. This brass rod was fixed inside a glass tube of considerably larger diameter, in order to insulate it where it passed through the top of the flue. During the experiments several different arrangements of discharge points were used, as, for instance, a brass ball having spikes projecting from it all round, a ring with spikes fixed upon it pointing in all directions, a cross studded with spikes in a similar manner, etc.

The electric machine, being kept dry and warm in the shed, worked in a very satisfactory manner during all weathers, giving sparks some 4 in. in length.

The first experiments tried were upon the lead fume in a state of quiet; that is, the flue was filled with fume by allowing a strong current of it to pass through from the main flue, and then simultaneously closing the inlet and outlet dampers. The fume thus inclosed in the chamber, when viewed through the windows, appeared as a very dense fog or mist. Left to itself, it took many hours to deposit. But as soon as the electric machine was set to work, the same action took place as with the magnesia in the bell-jar. Through the windows could be observed the same whirling movement around the discharge points, and in a few seconds the fog was seen changing into little flakes, like snow flakes, which rapidly flew to the sides of the chamber, and were there deposited, till in an incredibly short time the "fume" had entirely disappeared from the atmosphere of the chamber, which was as clear as before the fume was let into it.

Further experiments were then tried as to the action of the electric discharge upon the fume in rapid motion as it is in the flues of the works. The damper in the main flue being closed, the whole of the pressure of the furnace gases was turned through the experimental flue and allowed to stream out into the air. Then the electric machine was worked as before. No effect could be seen through the windows, because the rapid current swept the fume onward too fast to allow of any change being observed at that point. But at the outlet into the atmosphere, a few seconds after the discharge of electricity commenced, the effect was again very striking, the issuing fume again changing from fog into flakes. A glass plate held in the current before the discharge from the machine began was only coated, after considerable time, with a thin film. A similar plate held in the current during the working of the machine was instantly coated over with flakes and large separate specks of fume. So much was the fume agglomerated by its passage past the discharging points, that on some occasions in perfectly calm weather some of it would fall to the ground immediately on leaving the exit opening of the flue. In short, the series of experiments proved that what took place under the bell-jar took place equally in the flue of a smelting works, with all the attendant circumstances of heat, moisture, and acid vapors.

The trials of various arrangements of discharge points seemed to show that, within certain limits prescribed by the power of the machine in use, the more points employed the better was the result, the points being spread as uniformly as possible over the cross section of the flue through which the fumes are passing. On the strength of the satisfactory results above stated, Mr. Walker decided upon taking measures to apply this new process of fume condensation on a full working scale at the Bagillt Works. The necessary plant is now in course of erection, and nearly completed. The electric machines used will be on the Wimshurst system, with disks of 5 feet diameter. Two such machines have been constructed especially for the purpose by Mr. F. J. Cribb, engineer, of Chester. They will be driven by a small steam engine, the whole plant being placed in a small building close to the main flue of the works, through which pass all the gases and "fume" from nineteen furnaces.

Mr. Walker proposes to extend the process in England and most European countries and in the United States. It is intended to apply it to other branches of metallurgy besides lead smelting, as, for instance, the condensation of zinc oxide in the manufacture of zinc white, and the condensation of arsenic. But its principal field of usefulness will doubtless be in lead works, where so far all the proposed systems of condensers have either failed outright or proved so costly to erect and to work that the very imperfect results obtained did not render it worth while to continue their use.

The outlay for the requisite machines, etc., will be a very moderate sum, and the cost of running the apparatus, even for large works, will be limited to the wages of one man per twelve hours, and fuel for a boiler to develop the insignificant power required to drive the Wimshurst machines. There will be little chance of anything getting out of order, and in case a temporary breakdown of any kind takes place, the work of the furnaces will be in no way interfered with. This is perhaps the greatest recommendation of this process in the eyes of managers of works. Any one who has a run a works, the draught in which depended on mechanical arrangements, as is the case where fume is to be condensed by sucking or forcing through water, knows what a constant succession of breakdowns and stoppages has to be encountered. Mr. Walker's process causes, of course, no interruption of the proper draught in the flues under any circumstances. Fume which is now carried forward through the longest flues, and escapes from the chimney, will be rendered so much denser by the action of the electric discharge that it will not be carried anything like so far by the draught, and will rapidly deposit itself. Thus works which have now considerable flues may look forward to obtaining a greatly increased yield of condensed fume, while others which have not as yet considered it worth while to erect flues for the partial condensation to be obtained by their use will probably find it advantageous to do so, when by so simple a process as the one in question they can obtain from a moderate length of flue a greater yield than could otherwise be looked for from a very great length.

New German War Ship.

An addition to the German navy was made on the 18th ult. by the launch, at Dantsic, of the fast cruiser corvette Arcona, which took place in the presence of General Von Caprivi—chief of the German Admiralty—Admiral Jachmann naming the vessel. The Arcona is a sister ship to the Alexandrine, launched in February last at Kiel, and is of the following dimensions: Length between perpendiculars, 72 meters (237 feet); breadth of beam, 13 meters (42 feet); displacement, 2,370 tons. She is built of iron and steel throughout, and has a double planking of teak, sheathed with copper. Her draught of water when completely fitted up and fully armed will be 4·60 meters (somewhat over 15 feet) forward and 5 meters (16 feet 6 inches) aft. The vessel is divided into 8 watertight compartments by cross bulkheads, the two largest ones containing engines and boilers. She will have two compound engines, working independently of each other, placed side by side in the direction of the keel, and developing together 2,400 horse power. Steam will be supplied by 8 cylindrical boilers, 4 to each engine, placed in two separate boiler rooms. The estimated speed of the Arcona is between 14 and 15 knots (16 to 17 miles) an hour. She will be armed with twelve 15 centimeter (5·85 inch) and two 8·7 centimeter (3·39 inch) guns, one light gun, and four Hotchkiss guns. She will also be fitted with a launching apparatus for Whitehead torpedoes.

The Electric Light in Venice.

One of the most recent innovations of modern science is the introduction of the electric light into the old, primitive city of Venice. It was considered a sacrilege when boats propelled by steam were a few years ago introduced upon the canals of that quaint city, but the people became accustomed to them, and they will soon get used to the electric light, which will add brilliancy to the city, if not picturesqueness to a gliding gondola.

* See SCIENTIFIC AMERICAN SUPPLEMENT, No. 443.