

our own "Minneapolis" and "Columbia." The complement of the "Askold" is to be 580 officers and men. If our readers wish to make further comparison of this fine vessel with the sister ship recently built by the Cramps, they are referred to the SCIENTIFIC AMERICAN of November 5, 1898, in which will be found an illustrated description of the "Waryag."

II. "Chateaufrenault.—The French protected cruiser, the "Chateaufrenault," was laid down at La Seyne in 1896 and launched in 1898. She is 443 feet long between perpendiculars, has a beam of 55 feet 9 inches, and a mean draught of 22 feet 6 inches with a displacement of 8,018 tons. She is thus about 600 tons larger than the "Minneapolis." Like her, she is driven by three sets of vertical, triple-expansion engines. The boiler plant consists of fourteen Norman-Sigaudy double-ended boilers, which supply steam at a working pressure of 210 pounds to the square inch. It will be seen that she has unusual smokestack capacity, for not only are there four smokestacks, but they are of large diameter. Hence, the "Chateaufrenault" should have no difficulty in realizing a natural draught horse power of 13,800. The contract horse power under forced draught is 23,000, and the corresponding speed is 23 knots.

The armament consists of two 6.5-inch rapid-fire guns mounted on the main deck, one forward, one aft, and protected by shields, each gun having a separate ammunition hoist; six 5.5-inch rapid-fire guns in sponsons on the gun deck, two firing dead-ahead and two dead-astern, and each protected by a circular shield; and ten 3-pounders and five 1-pounder rapid-fire guns mounted in commanding positions throughout the ship. For protection the vessel depends upon a steel deck which is $2\frac{3}{4}$ inches thick on the flat and 4 inches thick on the slopes above the machinery. There is also $2\frac{3}{4}$ inches of steel protection on the sponsons for the guns.

The "Chateaufrenault" is designed for the same class of work as our "Minneapolis" and "Columbia," that of commerce destroying, and in order to prevent detection when she is searching for the merchant ships of the enemy, she has been made to conform, as far as possible, to the outward appearance of a modern trans-Atlantic steamer. Hence, there are no fighting tops on the vessel, and her masts and funnels are given the rake and trim appearance which characterizes the pole masts of a merchant steamer.

SOME PERSPECTIVES OF THE PARIS EXPOSITION.

Notwithstanding the amazing proportions of the Paris Exposition, the utmost perfection of detail has been maintained throughout. The casual visitor may look upon it as a mere agglomeration of beautiful, and, perhaps, fantastic buildings which have been erected for the entertainment of sightseers, but to the thoughtful it is something more than an ephemeral fairyland. It illustrates in the most elaborate manner possible the progress made by man during the last one hundred years in every department of art, science, and industry. It is a veritable epitome of the natural and industrial resources of the entire globe. The exhibition palaces are of vast size, and some of them are handsome, but others show that the too great facility with which staff can be worked, often results in rather meretricious decoration.

In the area between the Alma and Invalides Bridges, the nations have built a most bewildering series of palaces and pavilions and the effect produced by them is singular and pleasing. "Old Paris" adds a keynote of mediævalism and serves to link together the present and the past. The amusement sections are filled with interesting shows of a more or less serious nature, and the East adds a series of picturesque streets and squares. The Exposition authorities have endeavored to render the exhibition as complete as possible by inaugurating in each department retrospective and centennial sections in which the visitor can compare the past with the present and can form his own estimate of the wonderful advance since the time of Napoleon I.

There are forty-five entrances to the Exposition, but the visitor strolling down the Champs Elysées naturally comes first to the monumental entrance at the Place de la Concorde. This great gateway, designed by M. Binet, is, without question, the most criticised building that has ever been erected at this or any other exposition. It is familiarly known as the "Salamander," owing to its resemblance to a stove commonly so denominated. In its main lines it resembles somewhat a great wicker basket with long, curved handles, the whole affair being inverted and crowned by a female figure. It is painted blue, green and white, and the gilding is considerable. The front arch, facing the Place de la Concorde, is surmounted by M. Moreau-Vautier's startling creation. The figure is supposed to symbolize Paris, and is clad in the today's costume of a Parisienne. It terminates worthily the one conspicuous failure of the Exposition. The public enters through the great arch, and disperses by the two lateral arches, after passing through one of the seventy-six turnstiles. This arrangement is most ingenious, and permits of nearly one thousand people per minute entering the grounds at this point alone.

The turnstiles are placed back to back in double rank.

The visitor, after entering the gate, finds himself in a vast pleasure extending from the Place de la Concorde to the Pont des Invalides. The space is admirably filled with thousands of plants and flowers. The visitor crosses the Avenue Nicholas II., which separates the two Palaces of Fine Arts and then passes down the Rue de Paris, along which are distributed the buildings of the city of Paris, the Horticultural buildings and the palace where the congresses are to be held. Directly across the Seine is the "Street of Nations," with the picturesque and interesting buildings. The Quai d'Orsay continues the "Streets of Nations," after passing the Pont de l'Alma, but the Pavilion of Mexico is the last of the national buildings. Then comes the Pavilions of Hygiene, the Navy and Military Pavilion, the Palace of Navigation, the Pavilion of Forestry, etc.

We now reach the Champ de Mars, the arrangement of which is much the same as it was in 1899, but the long buildings on either side are quite different in design from those of the earlier Exposition, and the masking of the façade of the Electricity Building by the enormous Château d'Eau is most successful. It is in the form of a gigantic grotto, in which at night a fountain of rainbow-colored water plays incessantly. In the center of the immense basin is a symbolical group representing Humanity and Progress. The Palace of Electricity lies directly behind this ornamental fountain, and in the rear of it are the sections of Agriculture and Food and the great Salle des Fêtes. The Palace of Agriculture was the old Machinery Hall, and it has been completely changed. The buildings on both sides of the Champ de Mars extend from the Electricity Building to the Eiffel Tower. On the right side, beginning at the Electricity Building, are the sections given up to mechanical industries, civil engineering, transportation, education, letters, science and arts. On the other side are the buildings devoted to mechanics, textiles, mines and metallurgy.

The Eiffel Tower forms a great entrance to the Champ de Mars and was, perhaps, one of the chief attractions of the Exposition of 1889, and is the loftiest tower in the world, being approximately 1,000 feet high. The tower weighs 16,000,000 pounds, and millions of rivets were used in its construction. It has been recently repainted, and 60,000 pints of paint were used for each coat. It is illuminated at night by 7,000 electric lights of ten-candle power each. The view of the Exposition from the top of the tower is most attractive, the bright colored pavilions, towers and terraces showing off to the greatest advantage, and producing an effect of confused architectural magnificence never to be forgotten, recalling in many ways one of the fantastical panoramas of Doré. At the base of the tower are various concessions and exhibits, such as the Tour de Monde, the Palace of Costumes, the Cinéorama, the Maréorama, the Grand Celestial Globe, and various panoramas.

Standing at the Eiffel Tower the view of the Trocadéro is most imposing. In 1878, the Palace du Trocadéro was considered a wonder, but it now looks dingy by contrast with the white and parti-colored plaster buildings in the gardens housing the colonial exhibits. There is enough of the East about the scene to produce a bizarre and delightful appearance.

The ensemble of the Exposition shows a variety of architecture which might be called "architecture de fête," and reminds one of the handsome façades and arches which Renaissance architects and painters were so fond of building on all gala days. The architecture is nowhere severe, color is freely used and sometimes becomes vulgar. The question may very reasonably be asked whether or not any part of the Paris Exposition is of as effective architecture as the "Court of Honor" at our own Fair of 1893. On the whole there is not, although certain parts of the Paris Exposition are very fine, the Seine particularly playing an important part, it being rather more picturesque than any feature of our own Fair. The natural beauty of the site has not been destroyed, the gardening is perfect and everywhere there is an evidence of taste and good judgment in decoration with the exceptions noted, and over the whole Exposition there reigns a holiday air.

At the annual meeting of the American Academy of Medicine, Dr. Pyle referred to an article which appeared in a New York paper, entitled "Sleep Cure for Nervous Diseases." This cure consisted of eight grammes of bromine in a half glass of water every two hours. The paper also stated that the discoverer of this cure also maintains that rest—absolute prolonged rest—is the one thing which persons suffering from nervous disorders stand most in need of, and that they can obtain the rest through the agency of "bromine" better than any other way, says The Medical News. This only shows the great danger of medical advice which is given so freely in the daily papers. Bromine in an overdose acts as a corrosive poison and produces violent inflammation of the lips, mouth, tongue and œsophagus, with incessant burning pains followed in two hours and a half by prostration ending in death.

Engineering Notes.

In Siberia acetylene gas is largely used to light up various operations along the line where work is carried on at night.

The railway authorities of the Mexican government have been ordered to use certain safety appliances. All the passenger cars must be so equipped before the end of 1904.

Forty-one gas engines using blast furnace gas are working in Germany, the total horse power aggregating 21,950. The horse power of such engines in Belgium is 3,700, France 3,250, and England 2,060.

London is to have a new street, which will give a great thoroughfare north and south. The new street will begin at Theobald's Road, will cross High Holborn, and will finally reach the Strand by means of two arms which are limited by Somerset House.

The railway mileage of Europe has increased from 83,680 miles in 1875 to 167,439 miles in 1899. The increase has been the largest in Russia, amounting to no less than 15,142 miles; then comes Germany, 14,666 miles; and France with 12,990 miles; while England has added only 5,089 miles.

It is said that coal was mined prior to 1113. In the Liège district coal was first found about 1199. In 1214 coal was attracting some attention on the southern side of the Firth of Forth. This was a hundred years after the mines in the Worm district are said to have been opened and regularly worked. It is not likely that coal was mined in Great Britain before the thirteenth century.

The fire department of New York city has 94 engine and hook and ladder companies, and 1,375 officers and men in the Boroughs of Manhattan and Bronx, and the Boroughs of Brooklyn and Queens have 80 such companies and 1,029 officers and men. There are also 6 powerful fireboats in commission. The Boroughs of Richmond and Queens have a volunteer service of 1,725 and 2,000 men respectively.

A corporation has applied to Congress for permission to lay underground pipes in the streets of Washington, D. C., for the purpose of distributing cool air through the business buildings and residences of the city. The scheme provides for the erection of a refrigerating plant at some central point, from which cold air will be pumped for distribution through the system of pipes. The flow of cold air will be regulated in a manner somewhat similar to the measurement of gas, and can be turned on the same as hot air is turned on from a furnace.

The new engines of the Denver & Rio Grande Railway have iron pipes extending along the roof of the cab and connecting with the boiler. Through this pipe, without making a perceptible motion, says The Railway Review, either the engineer or fireman can send, under 200 pounds pressure, a jet of steam and boiling water that would effectually kill or injure anything living that happened to be on the tender or the front end of the baggage car. The blow-off cock thus arranged is expected to prevent train robbers climbing over the tender.

The West Shore Railroad Company recently had some litigation with a refrigeration company over a piece of land. The railroad company had a spur of track on the property, and when the refrigeration company began to drive piles for the foundation of its new building, the railroad company ran an empty box car upon the tracks and halted it in the line of the pile driver. The workmen proceeded to saw the car in two and throw off the piece that lapped over onto their property. The person, at whose instigation this was done was arrested, and a freight engine was backed upon the disputed property. The case was taken into court.

At the acetylene works which supply the gas to the Hungarian street railway, chloride of lime was formerly employed as the purifying material. They now use a mixture of chloride of lime and sodium plumbate containing an excess of alkali. Chloride of lime alone is likely to cause the explosion of the gas, on account of the liberation of chlorine. A purifier charged with a new mixture was opened after ten hours' working. When the upper grating, covered with lime, was removed, spontaneous combustion took place, and a long flame rose from the apparatus, but there was no explosion. Under these conditions, therefore, it is safe to say that the new mixture is not dangerous.

The administration of the Chinese Custom House has recently published its annual report, according to which the exterior commerce of China has been, in 1899, 460,000,000 of taels (the tael equals about 75 cents), this being an increase of 21,000,000 over 1898. The revenues of custom houses were 26,000,000, and increase of 3,000,000 over 1898. The exports have been 195,000,000, surpassing those of 1898 by 36,000,000, and the imports are valued at 264,000,000. The imports from America and Japan have given the greatest increase. The vessels which have entered in 1899 into the Chinese ports give a total of 5,479,000 tons, the figure for 1898 being 4,927,000. England represents 59 per cent of the total; China, 24; Japan, 7; Germany, 5; France, 2; America, Sweden and Russia, each 1.

Science Notes.

The Italian faster, Succi, has been declared insane and is confined in an asylum.

A solid train of twenty carloads of salt was recently shipped from Salt Lake City, Utah.

Prof. Loeb, of the University of Chicago, has made interesting experiments upon the artificial fertilization of the eggs of sea urchins, and the production of larvæ after an immersion of two hours in a solution of magnesium chloride and sea water. The sea water and the instruments were carefully sterilized.

The arrow poison of the Wagogo, is derived from the juice of the bark of two Euphorbiaceous trees by continued boiling. Brieger has isolated therefrom a crystalline body, which corresponds chemically and physiologically with the Wakamba arrow poison. The Euphorbia juice appears to act as a progressive poison.

The ninth volume of "Le Opere di Galileo Galilei" was recently published in Florence, and shows that he had an excellent appreciation for Italian literature. The six volumes include an address which he made on the topography and configuration of "Inferno." This was delivered before the Florentine Academy of Sciences.

A new developer has appeared, orthodioxymbenzol, which, under the name of Elconal, is proposed by Dr. Ludwig Ellon. It has the singular property of allowing a mixture of hypo in all proportions, and a combined developing and fixing bath may be thus prepared. It is spoken of very highly by photographers who have used it.

Portugal was very liberal to scientific men at the time of the recent eclipse. The Custom House employes were ordered to give astronomers every facility for the entry of their baggage, their instruments being admitted free on the presentation of a certificate from an astronomical observatory countersigned by a Portuguese consular agent.

Rubber culture was first scientifically undertaken at the Botanical Gardens at Peradeniya, in 1876, by Dr. Trimen, and in 1897 Ceylon boasted of 250,000 trees of the Brazilian variety which yielded an amount of one pound and a half per tree, fifty trees being planted to the acre. It is fortunate for Brazil that very little of the East possesses the soil, climate and conditions necessary for such competition. The present tendency is now to introduce machinery and chemical processes in South America requiring more or less technical skill. Some companies are using centrifugal machines.

The walls of the Comédie Française, Paris, were found to have been severely damaged by the fire, and one of them needs practically to be rebuilt, while much has to be done in the way of strengthening the remaining three. The corridors and staircases are to be widened and the arrangement of the dressing-rooms is to be modified. The building will be lighted and heated on an entirely new system, and elevators will be provided both for the use of the public and the actors. The theater will probably be a model one, if the plans are carried out to a successful completion. It is not likely that the Comédie Française will be completed until the close of the present year.

The new developer, adurol, which is prepared in Germany, is increasing in popularity. According to the report of the Imperial College, of Vienna, it is superior to hydroquinone as a developing agent, and gives less fog. The image, developed in adurol, appears in five to ten seconds, as compared to forty seconds with hydroquinone; the development is completed in four to five minutes as against six to seven minutes with the latter. The finished image is also somewhat softer in tone. Prof. Vogel, the late eminent photographic authority of Berlin, and Prof. Bothamley, of London, are of the same opinion, and prefer the new developer to hydroquinone.

In Annam the number of persons who live mainly upon fish is estimated at five millions. The fishing industry has reached a considerable development in that country. The region most abounding in fish is that of the southern provinces, Binh-Thuan and Khanh-Hoa, and that of Thanh-Hoa in the north. The latter district supplies fish to the Tonkin markets and a part of China. The two former provinces, owing to the numerous bays where fishing may be carried on in all seasons, supply the salting establishments which furnish their products to Singapore and the extreme Orient. In other regions of the coast of Annam the supply of fish serves only to supply the needs of local consumption, and is even insufficient for this. As to river fishing, it is reduced to the needs of the inhabitants of the banks. The outfit of a fishing bark of small tonnage is four men and two children, and for the large sailing junks it consists of seven adults and three to four children. The number of persons engaged in the fishing and kindred industries in Annam has been estimated at 30,000, of which 6,000 are in Thanh-Hoa and 5,000 in Quang-Nam. In adding the women and children, this number may be carried to 60,000, representing the total number of natives who make their living from the fishing industry.

Electrical Notes.

The main lighthouse at Sandy Hook was struck by lightning on May 21, and its electrical apparatus was much injured; oil had to be used in the lamps.

Electricity is to take place of steam at the shifting tables of the 30-inch rolls at Homestead, Pa. The only part of the plant which will be operated by steam will be the big roll engines.

From April 15 to May 13, 799,479 passengers paid for using the moving sidewalk and the third-rail system in the Paris Exposition grounds. The greatest number of passengers carried in one day was 75,000, says The Electrical World.

Electric traction which the London Metropolitan District Railway have introduced upon their system between Earl's Court and High Street, Kensington, is giving satisfaction. The train consists of six coaches with a motor car at each end. The total length of the train is 245 feet, while its aggregate weight is 180 tons, and has accommodation for 312 passengers. The motor cars, with a rating of 800 horse power each, impart a mean speed to the train of 15 miles per hour, which is an increase of four miles upon the steam locomotive traction now in vogue. They can, if necessary travel at 20 miles per hour, and can attain that speed within 200 feet from starting and can be brought to a standstill in 130 feet which is only a little more than half its own length.

Mr. Richard Kerr, F.G.S., has been exhibiting to the members of the Royal Society in London his latest development of the Hertzian wave system. This is a clock, the movements of which are controlled from a distance by means of wireless telegraphy. The inventor proposes to be able simultaneously to adjust the whole of the clocks in London by means of this single timepiece. In order to render a clock sensitive to the waves he affixes to it a receiving instrument with a coherer. Then he establishes a transmitter at some point in the city, and by simply pressing a button every clock equipped with the receiver would be influenced, and the hands moved to any desired part of the dial. Not only would public clocks be synchronized in this manner, but the system might be extended to the timepieces in private residences as well.

The Postal department of the English government have commenced work upon the new telephone system with which London is to be supplied. Up to the present time the National Telephone Company have enjoyed a powerful monopoly, but the system has proved so unsatisfactory, that in deference to public opinion the government have entered the field of competition. Many of the subways to carry the wires—the underground system is to be employed—have been designed and are ready for excavation. The area is officially designated "The London Telephone Area," and practically covers the same ground as that served by the private company. The government scheme when completed will cover an immense area of over 600 square miles, and it is expected that the major portion of the system will be in working order in about twelve months' time. The central exchange will be situated near the present Post Office Savings Bank, while sub-exchanges will be distributed throughout the area. Ladies will be engaged in the exchanges throughout the day, and men will attend to the same duties during the night.

Three large engines of 3,000 horse power have been furnished by Sulzer Brothers, of Winterthur, Switzerland, for one of the electric stations of Berlin; these are triple-expansion, with four cylinders. The two low-pressure cylinders, of 50 inches diameter, are placed side by side, with their axis 8 feet apart; their pistons each operate a crank upon the main shaft, these being placed 90° apart; and the two high-pressure cylinders are placed over each of these respectively, with common piston rods. The upper and lower cylinders of each pair are separated by a distance of 5 feet, so that the pistons of the latter may be taken out without difficulty. Three iron columns fixed to the lower cylinder support the upper; the stroke of all the pistons is about 4.2 feet. A strong foundation-plate supports the bearings of the main shaft, which has a diameter of 1.4 feet; the superposed cylinders are carried on one side by a detached supporting piece, and on the other by iron columns. The vertical air pumps are connected with the piston-rod of the low-pressure cylinders. The latter cylinders have steam-cushions, as the use of superheated steam is provided for. The distribution to all the cylinders is made by four-way valves, which are operated by horizontal shafts worked by a vertical shaft carrying the governor, the latter being connected with the main shaft of the engine by helicoidal gearing. The valves are placed in the bottom and top covers of the cylinders. The main shaft carries at each end a fly-wheel 19 feet in diameter; having also on one end the armature of the dynamo. The engines make normally 85 revolutions per minute, which corresponds to a piston-speed of 12 feet per second. The great height of these engines may be observed by the fact that the top of the upper cylinder is 35 feet above the axis of the main shaft.

Automobile News.

Two lines of automobile communication will be opened for traffic in the neighborhood of Corunna, Spain, during the present year.

The London publisher, Alfred Harmsworth, while touring in France, has counted in one day, on the Riviera, 177 motor carriages and 269 motor tricycles.

A private automobile stable will be built in New York city in the fall. In addition to the carriage house, there will be a room for charging the batteries and quarters for the men who will take care of the vehicles.

A close observer states that by actual count the number of automobiles in regular use in Paris represents two or three per cent of the traffic on week days, with a very much higher average on Sunday and holidays, probably reaching five per cent.

At Maritzburg, in Africa, traction engines have been pressed into service by the British military authorities for transport purposes, and on some occasions they have been used to haul wagon-loads of refugee children into the country to give them an outing.

The Innsbruck Motor Car Company intends to run motor omnibuses on the most frequented of the Alpine highways. The vehicles will contain seats for fourteen persons, and will be as comfortable as the usual mail coaches. They will first run on the route from Innsbruck to Partenkirchen and to Oberammergau.

The automobile which has been ordered by the Prince of Wales from the Daimler Company has been turned over to Messrs. Hooper, of St. James Street, who are now finishing the body of the vehicle; it is to be ready in the month of June. The general finish will be in the same style as that of the other carriages belonging to the Prince, and it will, no doubt, be one of the finest automobiles to be seen in England. The body is of the phaeton type, with several modifications. The Prince has already had a number of lessons in the art of automobile driving, and will no doubt take a prominent place among the amateurs of the sport.

James T. Allen, of the Patent Office, has compiled a "Digest of United States Automobile Patents, from 1789 to July 1, 1899, including all Patents Officially Classified as Traction Engines for the Same Period." They are chronologically arranged under general heads of spring, steam, gas, air, electricity, gearing, traction-engines and miscellaneous. All the drawings are exactly reproduced from the patents, together with the claims, and a complete list of references cited against patents while pending as applications, together with lists of patents in the class of portable engines, traction wheels, electric locomotives and electric railway battery systems. The volume is particularly valuable, owing to the fact that no drawings are omitted, every sheet being given.

One of the latest types of automobiles is the new Swiss vehicle made by the Mees Company, in the canton of Zurich. Its construction presents a great number of interesting points. The company uses in its large vehicles a gasoline motor of the type known in Europe as balancier. Its two pistons move in opposite directions in a common cylinder, placed horizontally, and the force of the explosion which takes place between them is transmitted by piston rods and levers to a shaft with double crank placed above the cylinder in the recipient of the motor. In consequence, the motor unites the advantage of simplicity possessed by the single-cylinder type to those of a two or four-cylinder motor, namely, quietness and ease of working. It avoids the shocks which occur with the single-cylinder type, as the cranks are placed at 180° apart. In the smaller vehicles, a two-cylinder motor is used, this being placed in front of the vehicle. To diminish as much as possible the consumption of water, the explosion chamber alone is cooled with water, while the portions of the cylinder on each side carry the usual radiation ribs. In the large vehicles, the motor is placed on the rear axle, and is covered by a case provided with a shutter, and inclosing the reservoir of gasoline, which acts at the same time as carbureter, and the water recipient. These two contain from 50 to 60 quarts, and for long trips an extra reservoir may be placed on or under the front truck. The water which is heated in the envelope of the motor cylinder is cooled by an exterior spiral tube with cooling ribs, and is brought back to the motor by a small rotary pump. The transmitting mechanism is of a novel type, and consists essentially of a gear-wheel mounted upon the main shaft, with which engages a pinion on each side, these engaging in turn with a toothed crown which surrounds the whole. The arrangement of the mechanism is such that when the motor runs empty, the pinions revolve around the inside of the crown, but when they are prevented from turning by stopping the disk upon which their axles are mounted, the force is transmitted to the central wheel. By this arrangement the motor is always in gear, and it is thrown on or off without shock. The speed-changing device provides for 7.4 and 74 miles per hour, and an extra device gives also 6 and 13 miles.