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, for the U. S. or Canada.....$3 00
One copy, six months, for the U. S. or Canada..... 1 50
One copy, one year, to any foreign country belonging to Postal Union, 4 00
Remit by postal or express money order.

Australia and New Zealand.—Those who desire to receive the SCIENTIFIC AMERICAN, for a little over one year, may remit £1 in current Colonial bank notes. 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, for U. S. and Canada. $6.00 a year to foreign countries belonging to the Postal Union. Single copies, 10 cents. Sold by all newsdealers throughout the country.

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year, to any address in U. S. or Canada, on receipt of *seven dollars*.

The safest way to remit is by draft, postal order, express money order, or registered letter.

Australia and New Zealand.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for a little over one year on receipt of £2 current Colonial bank notes.

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

NEW YORK, SATURDAY, JUNE 8, 1889.

Contents.

(Illustrated articles are marked with an asterisk.)

TABLE OF CONTENTS OF

SCIENTIFIC AMERICAN SUPPLEMENT

No. 701.

For the Week Ending June 8, 1889.

Price 10 cents. For sale by all newsdealers.

AN EXPECTED REVOLUTION IN STEAM NAVIGATION.

A new and interesting experiment in marine propulsion is to be tried soon in this harbor. We allude to the new water jet boat invented by Dr. Walter M. Jackson, of this city. The vessel is 100 ft. long, 100 tons burden, with a boiler intended to yield 1,500 h. p., applied to a Worthington pump, and used to eject a small stream of water—a three-quarter inch jet—from the stern post, at the keel line. The water is to issue under the enormous pressure of 2,500 lb. to the square inch, and a speed of between thirty and forty miles an hour is expected by the owners—a velocity far in excess of any other craft afloat. The stern water jet issues from a faucet which takes the place of a rudder. The faucet is operated by a lever in the pilot house. A jet pipe also extends from the main pump to the bow, where a similar faucet is located, also connected with the pilot house lever. Thus the pilot has absolute control of the vessel. By simply moving the lever, the boat can be instantly started, turned, stopped, backed, or made to spin around on its axis like a top. All this without stopping the driving pump. No jarring, noise, or vibration is felt, even at the highest speeds. The new boat is named the Evolution, but, perhaps, a better cognomen would be Great Expectations, for the promoters are sanguine the little vessel is the precursor of a grand and rapid revolution in the art of steam navigation. They are confident the days of common marine engines and propellers are numbered, and will soon be thrown out of all first class ships as old iron, and the diminutive water jet substituted. A large saving in space, greater economy in fuel, increased safety, improved comforts for passengers, are mentioned as a few of the important results that will attend this outflow of high pressure water.

The water jet, as a hydraulic system for the propulsion of vessels, has been many times tried with excellent results, but has not proved economical as compared with the ordinary marine engine and propeller. In the back numbers of the SCIENTIFIC AMERICAN and SUPPLEMENT will be found particulars of some of these hydraulic motors, with illustrations of the vessels (see, for example, SUPPLEMENT, Nos. 308, 354, 415, 489, also 440, 561). In most of these cases it has been the aim of the projectors to make use of as large a water jet as possible, and a low water pressure, which involved the movement and discharge of a great volume and weight of water.

Thus a water jet of 5·33 square feet area and a velocity of water discharge of 30 feet per second has been employed. This was in accordance with high scientific authority, such as Prof. Rankine, who maintains the most efficient propeller is that which sends the largest volume of water astern at the slowest speed. A variety of reasons and calculations have been put forth by others to prove that the small water jet, with high pressure and high speed, cannot possibly be as effective or economical as the big pipe and great weight of slow water. But it is a curious fact that in several subsequent experiments reduced water jets (7½ inches) and higher water velocity (66 feet per second) have given better results.

Dr. Jackson's scheme involves a radical departure from the hitherto accepted theories and calculations of water jet propulsion. In his new boat Evolution he reduces the old 5 square feet area discharge pipe down to an area of less than half a square inch (0·44 square inch), and increases the velocity of the water discharge from 30 feet per second up to 600 feet per second. By so doing he claims to secure superior practical results.

On the trials last summer of his small experimental boat Primavista, he used a jet only three-eighths of an inch in diameter, with a water pressure of 600 pounds to the inch, and obtained a speed of ten to twelve miles per hour. Many experiments were then made with this boat. The apparatus was crude and hurriedly made, but the results yielded much new, instructive, and valuable knowledge concerning the practical propelling powers of small jets at high velocities; and this new knowledge is embodied in the novel craft which is now receiving her finishing touches. One hundred thousand dollars, clean cash, have been put into the little vessel by the contributions of a number of able citizens, who fully believe in the correctness of the calculations of the ingenious inventor. Dr. Jackson is a man of varied scientific attainments, extensive mechanical experience, and good judgment. His inventions relating to gas machines have proved highly successful.

In this connection we would suggest to the naval authorities at Washington the propriety of supplying all of the new war ships with hydraulic jet pipes and pumps, as means for facilitating the navigation of the vessels and promoting safety. There appears to be no reason why bow and stern jets might not readily be put in, at no great cost, which would be highly useful in action and other emergencies requiring rapid maneuvering of the ships.

88,200 barrels of flour is the report of a recent one week's work for the mills at Minneapolis. Is there any other place in the world where such a large production is realized?

The Annual Meeting of the American Institute of Mechanical Engineers.

On May 21 the annual meeting of this society opened at the house of the American Society of Civil Engineers. The report of the secretary, Mr. R. W. Pope, was read. It showed 350 members in good standing, and an increase at the average rate of five per month, a very practical testimony to the increased interest taken in this branch of science by engineers. Mr. Edward Weston, the retiring president, after an address on the importance of enlarging the scope of the Institute's work, introduced his successor, Prof. Elihu Thomson, who, in his answering address, followed the same line of thought, and spoke of the opportunities before the Institute for work in the interest of electrical engineering. On May 22 the reading of papers began, the session beginning at 10 a. m. The following papers were read and discussed:

"Some Results with Secondary Batteries in Train Lighting," by Alexander S. Brown, Pennsylvania Railroad.

"The Inherent Defects of Lead Storage Batteries," by Dr. Louis Duncan, Johns Hopkins University.

"Motor Regulation," by F. B. Crocker, instructor in electrical engineering, Columbia College.

"Magnetism and its Relation to Induced Electromotive Force and Current," by Prof. Elihu Thomson, Lynn, Mass.

"The Relation between the Initial and the Average Efficiency of Incandescent Lamps," by W. H. Peirce, Chicago, Burlington & Quincy Railroad.

"The Efficiency of the Arc Lamp," with an introductory note by Prof. E. L. Nichols, by H. Nakano, Cornell University.

"The Spiral Coil Voltameter," by H. J. Ryan, Cornell University.

"The Personal Error in Photometry," by Prof. Edward L. Nichols, Cornell University.

The titles of the papers and the authors' names vouch for their interest. Prof. Nichols brought out one very practical point: that in the use of the Bunsen disk with reflecting mirrors the observer was liable to introduce a personal error if he adopted the stereoscopic method of inspecting the disk, or used one eye for the right side and the other for the left. This habit, which many photometrists fall into, is unquestionably a bad one, and its treatment by Prof Nichols is of interest to gas engineers as well as to electricians. In the evening a special session was held at the College of the City of New York to listen to Prof. H. A. Rowland's experimental lecture on "Modern Views with Respect to the Nature of Electrical Currents." Many well known electricians as well as the members of the Institute were present at this lecture, and the room was crowded to overflowing with an appreciative audience.

The Leland Stanford, Jr., University.

Mr. G. T. Shepley, the architect of the Leland Stanford, Jr., University, states in the San Francisco *Building Advertiser* that the work on the large dormitory in connection with the university has been commenced. The buildings completed, or nearly so, number fourteen, and consist of lecture rooms, reception rooms, laboratories, and all the requisite departments for a complete educational course. The dormitory will be situated about a thousand feet from the other buildings. It will be 275 by 145, four stories high, presenting a very imposing structure. The material used is San Jose stone. The building will accommodate two hundred students. Single rooms will be 18 by 26, and double rooms 24 by 26. Altogether there will be from one hundred and twenty-five to one hundred and fifty rooms. There will only be one dining room for the two hundred students, and this will occupy the central portion of the lower floor. The kitchen, laundries, etc., are in the basement; but, as the dining room is raised considerably above the floor on which it is situated, there will be plenty of light and air afforded for the basement. All the fifteen buildings will be heated by steam and lighted by electricity from one central station placed in the rear of the quadrangle. The university will not resemble any of the Eastern universities to any great extent. All the old colleges are built around quadrangles, and in this one point the Leland Stanford, Jr., University will resemble them, but in no other. There will be a magnificent view from all the sleeping rooms of the dormitories.

M. DE FONVIELLE has made very curious electrical experiments at the summit of the Eiffel tower. Some, it is considered, will lead to important considerations of a scientific character, which will be continued; others are of a more practical character. The atmosphere round the tower at this elevation is free from all influence of the soil, as would be the case at the top of a mountain, and the air is in an extraordinary active state of electricity. The tower will, it is said, be the most perfect conductor of electricity during a storm, and all within it will be in a state of entire immunity against all danger from lightning. The pretty idea has been suggested of having a carillon of bells at the top, which will play every two hours.

[SPECIAL CORRESPONDENCE OF THE SCIENTIFIC AMERICAN.]

The Paris Exhibition.

A MAGNIFICENT AFFAIR—NOVELTIES IN THE AMERICAN SECTION—POVERTY OF THE ENGLISH SECTION.

PARIS, May 16.

It is conceded on all sides that this exhibition is a truly magnificent affair. No previous exhibition has approached it, either for size, beauty, or the quality and value of the exhibits. "I have been to every exhibition at which the United States government has been officially represented, and unhesitatingly assert that it very far surpasses anything attempted," said Mr. Thomas R. Pickering, the superintendent of machinery of the American section. "There never was so grand an exhibition, and it is questionable if there will ever be such another," said Mr. Doane, of Messrs. J. A. Fay & Co. The Eiffel tower, which so many people stigmatized as ugly and unattractive, is now conceded to be a thing of grace and beauty.

My first proceeding after the opening day, of which you have doubtless received full advices, was to take a general survey of the "Palais des Machins," whose immensity is exceedingly striking, and then to take a preliminary survey of the main buildings, so as to give your readers a general idea of the situation, which is as follows:

Except in the "Palais des Machins," the French are the most behind, and even there much of the machinery has been standing still, because there is no steam supply. This defect, however, will be remedied to-morrow.

The American section of machinery shows more progress in design and more valuable novelties than any other section, and many claim than all the others put together, and it seems to me at present writing that the claim is well founded.

The English section is small and possesses no distinguishing feature that I can so far see, except that of copying American designs, which is done to an altogether astonishing degree.

This is done with so much persistency, and old American designs are claimed as English with so much effrontery, while more advanced and superior American designs are so pooh-poohed by some of the English I have encountered here, that I determined to "speak out in meeting," and put this matter straight at once. So I took a hasty survey of the English machinery, with the following result:

On a milling machine I found the disk friction feeding device of William Sellers & Co., of Philadelphia, whose patent has expired. I also found a twist drill grinding machine whose sole novel feature is copied from the Sellers twist drill grinding machine. I also found twist drills with the line down the center of the flutes, after the Morse Twist Drill Company's patent. Another piece of piracy is a planer chuck that has been patented in England, and is commanding a large sale. One of its chief points, if not its chief one, is a direct copy of the main feature of Thomas' American patent planer chuck, this particular feature having been pointed out in the SCIENTIFIC AMERICAN, in 1875 or 1876. The rack feature now so common in American practice (the patent having expired) is copied, the only variation being that a single set screw is used, being placed central and abutting against a convex projection, so that the set screw point will bed fair, notwithstanding that the jaw may be at an angle for taper work. The Fox lathe as it was made in the United States seven or eight years ago appears, and several copied modifications of it, all being claimed as English. But the more recent American improvements are lacking, such, for example, as making the bed in two parts, so that the tail stock end may be taken up by raising that part of the bed.

I found turret head lathes here with no stop motion, the workman using his calipers, etc., in the old fashioned way. There are milling machines of English make carefully copied from American designs, with not a perceptible English feature about them. One or two of them have copied the movable bar for the dead center of the spindle. Another English machine has on it the American feature of a wire feed. Of a cutting-off machine copied from American practice an English machinist said to me, "It's a very good machine, but don't you think such machines an unnecessary refinement?" for otherwise I should have been told that it was an old English design that had been thrown away in England long ago. Your readers will doubtless picture this individual cutting up large rods or shafts in the blacksmith shop, chipping and filing the ends square for the centers, truing up the ends and cutting the pieces to length, and thus spending as much time and money on the job by the time it was ready to be turned up as the whole job would cost if a cutting-off machine had been used.

The editor of a prominent English engineering newspaper was here last week, and, I understand, expressed himself rather strongly on the poverty of the English section, and at least one engineer gave me to understand that the English machine tool makers would rather be excused from meeting their American competitors in any market unless the prices were overwhelmingly in their favor. There is only one American design of prominence that, so far as I have yet observed, is exhibited in the English section and not claimed as of English origin, and that is the Horton lathe chuck.

I next turned my attention to the United States section, to see what there was put forward as new that was copied from English or other foreign designs. I found nothing, but I found much that was new and very interesting indeed. I consider the cutting tool design and arrangement on Warner & Swazey's special lathe for brass work one of the best things I have seen for many a long day, and it is entirely original.

A walk through the other sections of the Palais des Machins shows that although the English are the greatest, they are not the only sinners, except it be in refusing credit to the American origin of their designs.

Amer et cie., Bale, Switzerland, have the Sellers rack and pinion (with its rolling contact) on their planer, but not on the pulley end of the pinion shaft, a combination, as is the case with the more recent Sellers' machines. The Ateliers de Construction Oerlikon, Zurich, have milling machines copying those of recent American design, and also lathes with the features of the "Fox" pattern. The tail stock of one lathe is constructed exactly like the dead center block used with American milling machine chucks. Baruquand, Paris, exhibits a screw machine having the Fox construction in connection with a Brown & Sharpe turret head and the American die and holder used in American screw machines.

A large amount of emery grinding machinery is shown, all embodying items of construction of distinctly American origin, with a variation of details. Of a great many of these it may be justly said that the parts that are new are not good, and the parts that are good are not new. The French show a great deal of emery grinding machinery, and, taken as a whole, it is very creditable indeed—much of it of the very first order and original. The Tanite emery wheel (Stroudsburg, Pa.) is a great favorite here.

Some of the details on French engines are, to my mind, decidedly objectionable, but the workmanship is, as far as I have at present observed, thoroughly good. Two engines of the Wheelock (U. S.) patent are here, one of them a pair of compound condensing engines and the other a high pressure. The latter has a flywheel of about 14 feet diameter, with internal gearing inside its rim, a feature for which there is, in my opinion, nothing favorable to be said.

"High piston speed" has not as yet taken much hold in either England or France, although the Armington-Sims engine (Providence, R. I.) is a favorite.

The straight line engine (Syracuse, N. Y.) will run as soon as it can get steam, and I think it will surprise a good many to see her speed and quiet running, notwithstanding that her cylinder is not bolted to the foundation, but merely rests on it. This engine has a flexible steel belt to drive her section of the line shafting (another American novelty), and this brings to mind that I did see one thing of English origin that has been copied at a comparatively recent date in the United States, and that is link leather belting, of which I hear very good reports.

American engineers here speak very highly of the design of the shafting girders, which, being continuous and flat on the top, furnish a track on which an electric hoisting crane runs. This crane is very highly spoken of by those who tried it when setting their machines on their foundations or unloading them from cars or trucks. The management of the United States commission here is giving a great deal of unalloyed satisfaction, and everybody in the United States section would be entirely happy if steam was only turned on, so that they could run their machines.

There is a large exhibit of French locomotives, the workmanship being good, and I wish I could say as much of the designs; but of this, more hereafter.

There are not as many printing presses here as there were at Philadelphia in 1876, and they are all indebted to the puncturing device of the Bullock press (American), which was first exhibited at the American Institute fair in 1868, I think, and that rendered web perfecting printing presses possible. There are a great many steam engines and paper making machines, and a very full line of grinding machinery.

The general American department is, it must be confessed, disappointing. Tiffany has a fine exhibit, and so have the Gorham Manufacturing Co. Messrs. Lyons, of New York, have a very fine exhibit of umbrellas, better than any others I have seen, notwithstanding that an English umbrella has been supposed to possess all the virtues possible in an umbrella. Around Ball & Goldsmith's corset exhibit I noticed a continuous crowd, and the Meriden Britannia Company's exhibit is well spoken of. There is one unobtrusive exhibit here that has no one attending it, that wood workers and carriage builders linger over, and well they may, for it is truly American and altogether meritorious. I refer to an exhibit of bent woods by H. G. Shepard, of New Haven, Conn. I heard a Frenchman say (after closely examining the specimens), "I would like to know that man. He is a master of his subject." Drake & Co. (St. Paul, Minn.) have a beautiful display of petrified woods, and no handsomer or more attractive memento of the exhibition can be found than one of their specimens, of which I will go more into detail at some future time.

Dunlap & Co. (New York City) exhibit a fine case of hats, and it is getting to be understood here that a better hat can be got in New York than either in London or Paris.

The French general department is not yet fully opened. The English general department is disappointing, while the Austria-Hungary department is simply elegance itself, and throws into the shade all competitors. Indeed, it cannot be said to have any competitors. The Russian department is very much better than one would anticipate, excelling in small bronzes.

There is a fine display of paintings and sculpture; but the galleries in the latter department are not open, while the department is in an unfinished state as far as the exhibits are concerned, heads, legs, and arms lying about in all directions. But the art departments are going to be very beautiful and delightful. There are not as yet any seats in the picture galleries; but there doubtless will be, as the galleries are so numerous that the crush there was at the Centennial galleries at Philadelphia in 1876 is not likely to be repeated here.

I heard to-day that in the construction of the Palais des Machins there were 60 men killed and 400 wounded, and perhaps it will do no harm at this late date to say that I was told in the machinery department of the Centennial exhibition of 1876 that during the hot spell, when the thermometer ranged from 100° to 104°, eleven people died from sunstroke received in that department in one day. Some people, however, attributed these deaths to the water, which in that year was anything but good.

There are no catalogues as yet, nor are the exhibits numbered in many cases, while in others there are two or more numbers, as is the case with statuary that has been exhibited at the Paris Salon, the old numbers remaining on a large yellow label, and some small white labels bearing different numbers accompanying them. Whether these latter are correct for this exhibition, there is nothing to indicate. JOSHUA ROSE.

New French War Vessels.

A steel cruiser named the Lalande has just been launched from the Chantiers de la Gironde, at Bordeaux. The Lalande is 316 feet 8 inches long by 31 feet 8 inches beam. Her displacement is 1,877 tons and her average draught of water is 16 feet 8 inches. Her engines, which were furnished by the Creusot Works, will work up to 6,000 horse power with forced draught, and when the engines are making 140 revolutions per minute it is expected that the ship will attain a speed of 19½ knots per hour. The Lalande will carry nine guns, of which three will be quick-firing and four revolvers. A torpedo cruiser named the Vantour has been launched at Toulon. Her hull, which is of steel, measures 226 feet 8 inches between perpendiculars. Her engines are to work up to 3,200 horse power, and she is expected to attain a speed of 20 knots. The Vantour will be fitted with four lance torpedo tubes and two Hotchkiss guns of long range. The Forbin cruiser has just made her trial trip. The average speed on the measured mile was 19¾ miles per hour.

Soapstone and Its Uses.

A writer in a London journal calls attention to the unappreciated uses and preservative qualities of soapstone, a material, he says, which possesses what may be regarded as extraordinary qualities in withstanding atmospheric influences, those especially which have so much to do with the corrosion of iron and steel, and from experiments made it is said that no other material is capable of taking hold of the fiber of iron and steel so readily and firmly as this. In China soapstone is largely used for preserving structures built of sandstone and other stones liable to crumble from the effect of the atmosphere; and the covering with powdered soapstone in the form of paint on some obelisks in that country, composed of stone liable to atmospheric deterioration, has been the means of preserving them intact for hundreds of years.

Electricity and Light.

Dr. Moser (*Eder's Jahrbuch fur Photographie*) draws attention to the following curious phenomena: The leaves of an electroscope are caused to diverge by charging with, say, 150 cells. On allowing a ray of direct sunlight to fall on the instrument the divergence is increased, and it returns to its original amount when the light is cut off. A common match (sulphur with phosphorus tip) will glow in the dark when brought close to a charged body such as the cover of an electrophorus. The mercury in a capillary electrometer falls when a ray of sunshine falls on it, just as it does when connected to the zinc of a battery. The effect is distinctly electrical, not thermal, as it vanishes when the upper and lower mercury columns are short-circuited by a wire.