

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., Canada or Mexico... \$3 00

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.

Building Edition of Scientific American.

THE BUILDING EDITION OF THE SCIENTIFIC AMERICAN is a large and splendid illustrated periodical, issued monthly, containing floor plans and perspective views pertaining to modern architecture.

Single copies 25 cents. By mail, to any part of the United States, Canada or Mexico, \$2.50 a year. To foreign Postal Union countries, \$3.00 a year.

Export Edition of the Scientific American.

with which is incorporated "LA AMERICA CIENTIFICA E INDUSTRIAL," or Spanish edition of the SCIENTIFIC AMERICAN, published monthly, uniform in size and typography with the SCIENTIFIC AMERICAN.

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 safest way to remit is by postal order, express money order, draft or bank check. Make all remittances payable to order of MUNN & CO.

Readers are especially requested to notify the publishers in case of any failure, delay, or irregularity in receipt of papers.

NEW YORK, SATURDAY, AUGUST 24, 1895.

Contents.

(Illustrated articles are marked with an asterisk.)

Atlanta Exposition, the... 115
Locomotive, a fast... 116
Bicycle notes... 115
Mining near the equator... 116

TABLE OF CONTENTS OF SCIENTIFIC AMERICAN SUPPLEMENT

No. 1025.

For the Week Ending August 24, 1895.

Price 10 cents. For sale by all newsdealers.

I. AGRICULTURE.—The Sugar Cane.—By C. A. BARBER... 16378
II. BIOGRAPHY.—Funeral of Professor Huxley.—Includes a list of many eminent scientists who attended the funeral of the great evolutionist... 16377

THE UNITED STATES CRUISER COLUMBIA.

We recorded recently the rapid voyage of our new war steamer the Columbia, from Southampton to New York, the object being to ascertain the reliability and fastest speed the ship is capable of on an ocean voyage.

We infer, however, from the official report of Capt. Sumner, that the Columbia had a narrow escape from breaking down in her boilers, and probably another similar effort would use her up altogether.

The report says: With a smooth sea in the English Channel the ship made 18 to 19 knots an hour. With all the hatches on the forecastle down, considerable water came on board.

Wednesday.—Fair weather for the most part, sea smooth and moderate. Leaky tube in top row, middle box No. 6 fire room, boiler E. It was plugged with wooden plug.

In closing his report Capt. Sumner says: "It was not deemed practicable to make the last twenty-four hours run under forced draught, because of the unreliability of the boilers (we were blowing out tubes at 140 pounds pressure), the loose state of the engines from the long run, the great fatigue of the crew, and above all the impracticability of getting a coal supply to the boilers with sufficient rapidity, as the coal was located at this stage of the run.

She had on board on starting from Southampton, 1,862 tons, of which she consumed 1,474 tons, leaving 328 tons on board when port was reached.

CHINCH BUG EXTERMINATION.

One of the destructive pests of the West is the chinch bug, which, in certain years, does immense damage to the crops all over the grain regions.

At the State Experiment Station connected with the State University of Minnesota some very interesting experiments are being conducted, under the direction of Prof. Otto Lugger, of the chair of entomology of the station, in spreading this disease among the healthy bugs of the farms of Minnesota.

In any event, the investigations are proving that there is an important economic side to the work, and it is but fair to say that thousands of dollars will be saved to the farmers by the spreading of the disease.

The disease, which is known as the Sporotrichum globuliferum, is cultivated at the station in large quantities. It develops rapidly and the capacity of the plant, so to call it, of the station is about one hundred quarts per week.

The result is that the diseased bugs convey the disease to the healthy ones, and, as one bug may convey the disease to many hundreds and each one of these many hundreds may convey it to other hundreds, it is not long before the disease is spread to an enormous extent.

A tiny portion of the disease, to start with, is placed in a good medium for culture—agar-agar, corn meal, and beef tea and ordinary potato being the mediums most in use—and then the disease spores develop with marvelous rapidity.

was a deadly foe to the chinch bugs. This practical application of the knowledge is a distinct and important step forward in the way of utilizing interesting and thoroughly scientific information for the economic advantage of the farmers of a vast region of country.

The conductivity of metals decreases and that of some bad conductors or insulators increases with the temperature.

A current of one ampere, flowing through a resistance of one ohm, develops therein 0.24 heat unit per second.

Printers' roll composition makes an excellent flexible mould, but in electrotyping it can safely be used only in a saturated plating solution.

A horseshoe magnet will lift a load three or four times as great as a bar magnet of the same weight will lift.

One legal ohm equals 1.0112 British Association units; hence, to transform resistances expressed in British Association units to legal ohms, the numerical values have to be reduced by about one-tenth per cent.

Plumbago brushed over the face of a medal or other metallic object—an electrotype copy of which is desired in intaglio—will prevent the copper or other metal electrically deposited from adhering.

In winding an armature, if it is found a coil has been wound in the wrong direction, it is unnecessary to unwind it. It is just as well to reverse the connections with the commutator.

Field magnet cores, for ring machines, should be 1.66 times the diameter of the armature core, if of wrought iron, or 3 times if of cast iron.

In designing a dynamo, the field magnet should be as strong as possible. An increase in the strength of the field increases the induction and the electro-motive force, or what amounts to the same thing, permits of decreasing the length of the armature for a given voltage.

Gutta percha heated in hot water at about 100° F. becomes plastic, and will take a fine impression with slight pressure. When gutta percha is soaked for a few hours in benzole or naphtha, it becomes swollen, and if it is then dipped in hot water, it becomes so plastic that it may be used with safety on very fragile and delicate objects.

In two pole dynamos the proportions of ring armatures vary from a length equal to one-half the diameter to a length equal to one and one-half diameters. It is common to make the length equal to the diameter.

According to Hering, with a suitable field magnet, every foot of active wire on the armature of a dynamo will generate about 1.2 volts, when the velocity of the wire is about forty feet per second.

A REMARKABLE HYDRAULIC POWER SUPPLY.

There has recently been inaugurated at the city of Glasgow a system of hydraulic supply works that possesses features of special interest. For many years the hydraulic hoists and presses in the city have derived their power from the mains of the common city water supply, which carried a pressure of 50 pounds to the square inch.

quired only 1-22 as much water at the higher pressure. Against this is to be reckoned the cost and operation of the powerful pumping engines, accumulators, etc., and the massive piping and plant, that is rendered necessary by the enormous pressure they develop; and also the extra care and more costly maintenance thereby involved. These latter items, however, are relatively insignificant compared with the vast saving of water. This is shown by the figures of Mr. Gale, the water engineer of the city, who estimates that a customer whose bill is at present \$350 will receive the same power for \$200 under the new system.

It would appear that this system of hydraulic supply from a central station has long passed out of the experimental stage. The first experiments in this direction were carried out in Dublin, Ireland, in 1802. The development, by Sir William Armstrong, of the hydraulic press led to the laying down of works at Hull; and in 1882 to 1884 a large system was established in London, where it has proved a great benefit to the public and a complete financial success. There are in London 75 miles of mains, carrying a pressure of 750 pounds. This operates no less than 2,300 machines, and yields a revenue of \$250,000.

The plant of the Glasgow works is housed in substantial stone buildings, on the top of one of which is a large iron tank of 200,000 gallons capacity. It consists of four large Lancashire boilers, three sets of pumping engines of 200 horse power each, and two accumulators. Each engine will pump 230 gallons per minute against the accumulator pressure of 1,120 pounds. The accumulators have rams of 18 inches diameter and 23 feet stroke.

The engines deliver into 7 inch main pipes, which have branch 6 inch and 5 inch pipes serving the main streets.

Compared with other systems of power supply from a central station, this is probably the least known. Steam power, pneumatic power and electricity have all been tested on a large scale, the pneumatic system in Paris and the other two in many places and on varying scales. As compared with steam or electricity, hydraulic power has the decided advantage that there is very little loss in transmission. The most careful methods fail to prevent a considerable condensation in the piping of the steam supply, whereas the hydraulic system, when worked at such a high pressure, must show an almost inappreciable loss of head by friction in the pipes. As a result of the small volume of water necessary for work at such high pressure, the flow in the pipes would be proportionately slow and the friction light.

There is no danger from rupture of pipes and escape of steam; and owing to the great thickness of the piping, its useful life will be proportionately long.

Compared with the electric supply system, the superiority of the hydraulic system is open to question. It is freer from risk to the consumer, both in person and in property, and there is less loss in transmission; but the great facilities for transmission afforded by the use of electricity far outweigh the risk from fire that at present attaches to electrical wiring.

The relative difficulties and expense attached to the distribution of power through a building by heavy and massive piping, or by electric wiring, are vastly in favor of the latter.

There is one feature of a hydraulic supply system that should be mentioned as giving it special value, from a municipal standpoint, and that is that it furnishes a powerful supply for fire purposes. Water at one-half ton to the square inch, on tap at any point in the streets of a city, constitutes a powerful fire protection. Such water could be thrown to great heights and distances, and, as any one who has watched the hydraulic mining of the West can understand, it would tear its way quickly through walls and partitions, to reach concealed fires, more rapidly than any opening could be made for it by the firemen themselves.

It is intended to utilize the Glasgow supply for fire extinction. At the recent inauguration of the works, couplings were made and a powerful stream was thrown to unprecedented heights and distances. The tests were made in the presence of Sir William Arrol, the contractor for the Forth Bridge, and many eminent engineers, and was considered highly satisfactory.

#### Atlanta Exposition Notes.

The Chief of the Department of Public Comfort has arranged with the Pullman Sleeping Car Company for three hundred sleeping cars to be parked on the railroad sidings in and near Atlanta. These sleeping cars will accommodate between 7,000 and 8,000 people and the berths will be rented for \$1 per night. The listing of rooms by the public comfort department has been very satisfactory and includes apartments in some of the handsomest residences in the city.

The gates of the Exposition have been closed and a twenty-five cent admission is charged to keep off the crowd during the period of installation.

One of the interesting features of the Exposition will be the Phoenix Wheel, which will be 125 feet in dia-

meter and will be placed upon the highest part of the midway, 65 feet above the lake level, thus carrying passengers nearly 200 feet above the general elevation of the lake and plaza and giving a commanding view of all the buildings, the grounds and the surrounding country. The wheel will be lighted by electricity at night; its capacity will be about 250 people at each revolution.

Mrs. W. D. Grant has secured from the Commissioner of Patents an exhibition of inventions of women. This will include about 125 models. It will be the first exhibit of women's inventions ever made at an American exposition. It will be separate and distinct from the general exhibits of patents, which Mr. Seymour will make in the United States Government building.

Mrs. Mary S. Lockwood has consented to deliver a lecture on "The Inventions of Women" on October 21.

The Department of Colonial Relics will be one of the most interesting departments of the Exposition.

The Art Department promises to be one of the best features of the Exposition. Mr. Horace Bradley, chief of the department, has returned from Europe with a long list of works of artists of distinction. Many of the leading artists of America will contribute works of art. The work of picture hanging was begun August 10.

#### Cycle Notes.

A new contrivance has been invented to spot the bicycle thief. A steel spring runs down the rear post of the frame connecting with the small sprocket wheel; a key turns this spring, so that when the wheel is in motion the sprocket wheel hits against it, making a clicking noise which can be heard a long distance. When the owner wishes to ride, the key is turned back and the spring falls against the inner wall of the post.

The "Ki-Yi," or cycle tourist's gun, is a very effective weapon against dogs which delight in worrying cyclists. A few drops of diluted aqua ammonia from the nozzle of the Ki-Yi gun will soon give the bicycle-chasing dog a lesson he will not be likely soon to forget. A small clip upon the nozzle prevents the escape of the ammonia.

The general superintendent of the New York State Reformatory writes us: "The captain of the watch at this reformatory makes his rounds within the prison proper through the main corridors, a distance of about one-half mile, on a bicycle, and we find it a very happy suggestion. His trips are swift and noiseless and he is thus able to detect any duty defect on the part of the under watchmen."

M. Reviere covered 523 miles and 10-29 yards in twenty-four hours on the Humber bicycle.

When inflating a tire should the rod rebound from the air pump, the air valve in the tire to which the pump is attached should be examined, as there is probably a leak somewhere and to continue pumping up the tire is only labor lost.

It seems pretty well agreed that next year tires will be larger than those now in use, more tires will be built  $1\frac{1}{2}$  and  $1\frac{3}{4}$  inches in diameter. It is probable that the bicycles will have larger tubing.

A convenient way of tightening the chain is to unscrew the nuts on the rear hub, to allow free moving of the rear upper brace, then pull the wheel out until the chain is to the desired tightness, then re-tighten the nuts on the rear hub.

A curious bicycle has been invented by a resident of New York City. The pedals, instead of acting on the wheel by means of a chain and sprocket wheel, are practically pump handles and force water to a water wheel attached to the rear wheel of the cycle.

It is stated that the factories which are devoted to bicycle manufacturing in the United States now have a capacity of 560,000 bicycles per annum. Many of the factories have more than doubled the size of their plants within a few months. It is said that the cost of producing a first-class bicycle varies from \$25 to \$35.

There is a bicycle which is being introduced in England for elderly persons which is called a "bantam." It has very low wheels.

The latest thing for the army is a cannon mounted on a twin bicycle. The cannon itself is a steel rifled affair 34 inches in length, and weighs about 50 pounds, and is swung between the rear wheels, resting upon the connecting axle, and is further supported from above. The caisson containing the ammunition is carried on another duplex. Four artillerymen equip a battery. They furnish at once the gun crew and motive power.

It is reported that a septuplette wheel, which is 15 feet 6 inches in length, is now being made in Europe, and will shortly be shipped to this country. Its principal use will be for pacing.

Beware of a clicking sound in your machine. The chances are that it is caused by the balls in a loose bearing, and this demands immediate remedy.

A new record for Great Britain was made at Putney, England, on June 26, by Mr. Barden, who made a mile in 1:50 $\frac{3}{4}$ .

A lamplighter of Elizabeth, N. J., does his work

upon the wheel with the aid of a torch, without dismounting. It is a curious fact that one of his legs is an artificial one.

The Paris Figaro announces that the Emperor of Germany has taken to cycling, and is having a track built in the neighborhood of Berlin, to which, however, only members of the imperial family and their guests will have admittance.

In some places it is proposed to tax bicycles to add to the revenues of the county, and the only reason why they are not taxed is that the board of supervisors or other officers do not care to antagonize the large number of wheelmen who are among their constituents. The reasons advanced for the proposed innovation are that the extensive use of wheels has cut down the business of liverymen and kindred lines, thereby reducing the taxable property to an extent which should be made up by the wheelmen.

It is said that bicycles have seriously injured the sale of pianos in England.

#### DECISIONS RELATING TO PATENTS.

United States Circuit Court of Appeals—First Circuit.

WRIGHT & COLTON WIRE CLOTH COMPANY VS. CLINTON WIRE CLOTH COMPANY.

Appeal from the Circuit Court of the United States for the District of Massachusetts.

Decided May 10, 1895.

Aldrich, J.:

Art of Weaving Wire Cloth.—The claim of letters patent No. 239,012, granted March 15, 1881, to G. F. Wright, for art of weaving wire cloth, should not, if sustained, be construed so broadly as to give a monopoly of all the means for straightening or swaging wire in the wire weaving industry.

Letters patent No. 239,011, granted March 15, 1881, to G. F. Wright, for a shuttle for weaving wire cloth, if it presents a patentable device, does not cover all means of swaging turns of twist into wire, and the defendant's device covered by letters patent No. 299,895, granted June 3, 1884, to G. F. Wright, for a shuttle for weaving wire cloth, in which old and well known means are employed, does not infringe.

Under the doctrine that the patentee is entitled to all known and unknown uses to which his invention may be applied, the public is entitled to all uses of devices covered in expired patents, and the discoverer that old means will do a new work is not entitled to a monopoly.

If patentable at all, a combination of old means with improvements adapting it to new and non-analogous material and use, a patent will be limited to the combination modified by the improvements.

#### Photography in Musical Research.

The motion of a pianoforte wire when struck has been recently investigated by Kaufmann, whose paper on the subject is accompanied by a set of interesting photographic records. By vibrating the wire in front of a luminous slit and throwing the image of it upon very sensitive paper rotating upon a cylinder, a white line is traced upon a black ground. This line, which is due to the interruption of the luminous slit by the opaque wire, exhibits all the motions of the particular point in the wire which is crossed by the slit. In order to bring the plane of the slit into exact coincidence with the wire, an image of the slit, produced by a lens with the aid of the electric arc, was thrown upon the wire itself. Since the hammer struck the point photographed, the motion of the wire was traced from the very first, the commencement of the vibration being the most interesting stage. Hard and soft hammers were tried, the latter corresponding to those actually used in the piano. It was found that the duration of contact is longer with feeble than with hard striking. As the force increases, the duration of contact rapidly approaches a limiting value equal to that of a hard hammer of equal weight. But the practically most important result was the proof that when a wire is struck at a point between one-seventh and one-ninth of its length, the fundamental tone has a maximum, and the harmonics are very feeble. Hence a wire thus struck gives its strongest and richest tone.—The Optician.

#### A Pin Machine.

Among the operative exhibits that will be shown in Machinery Hall at the Cotton States and International Exposition is a pin machine. It is in two parts, the first of which makes pins and the second sticks them in paper. This will be done in full view of the visitors. A slender thread of brass wire is started in one end of the machine. It is cut, pointed and the head put on, and the completed pin is dropped into a bath which plates it with white metal. From this receptacle the pins are dropped into a sifter, which carries them rapidly to the sticking machine, where they are stuck in regular rows in the paper, and a complete paper of pins is turned out. The mechanism of the machinery is delicately elaborate, and it will be one of the most interesting exhibits in the Machinery Hall.