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(Illustrated articles are marked with an asterisk.)

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SCIENTIFIC AMERICAN SUPPLEMENT

No. 1025.

For the Week Ending August 24, 1895.

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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. The time made was seven days, less eleven minutes. This comes within a few hours of being as quick a passage as the best of the regular American liners in the merchant service, and is probably the fastest speed ever made by a war vessel of any class on a continuous voyage of the same length, about 3,000 miles.

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. The maximum roll was nineteen to port and seventeen to starboard. The ship was steaming 17 to 19 knots an hour on an allowance of 200 tons a day. At 12:10 A. M., July 27, a tube blew out in No. 6 connection of boiler F, and the boiler was put out of use for seven hours.

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. Steam was sent through auxiliary main pipes. Other plugs were placed in leaky tubes. The vacuum was poor and getting poorer, and the main condensers appeared to be greasy.

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. The run involved excessive labor on the part of most of the ship's company. There were twelve volunteers from deck on duty in the fire rooms for the whole run, and forty-eight more men from deck have been employed below for some days in supplying the lower bunkers with coal from the wing passages."

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. It was learned some time ago that there was a fungous growth, or disease, a white, powdery, dust-like substance, considerably like many of the fungous growths which visit plants, which, when applied to the chinch bugs, killed them.

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. The results attained are, so far, very satisfactory, and it is probable, from what has already been accomplished, that in the future the farmers will be able to very largely control the pest, and, it may be, totally eradicate it.

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. It is quite probable, too, that they will be able in the future to wholly control this, in some seasons, one of the most serious dangers besetting the crops.

In brief, the method employed is as follows:

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 disease is put up in small tin boxes, an inch or so in diameter, and then shipped to the farmers. The farmers collect a large number of healthy bugs, put them in low, damp wooden boxes in which wheat is growing, sprinkle the bugs liberally with the powder, and then set them adrift among the healthy bugs.

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. All the instruments for breeding the disease are of the most improved pattern and the sterilizing outfit is complete.

It has been known for several years that this disease 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. Complete ultimate success seems assured, and the several thousands of dollars appropriated by the Minnesota State Legislature last winter for the carrying on of Prof. Lugger's experiments seem to have been well invested. Mr. R. H. Pettit, recently of Cornell University, New York, is assisting Prof. Lugger in the work.

A. S. H.

ELECTRICAL ITEMS WORTH REPEATING.

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. For drum machines the figures are 1·25 and 2·3.

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. Specially adapted to electrotyping.

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. For drum armatures the length sometimes equals one and one-half diameters and sometimes three diameters. It is common to find the length equal to two diameters.

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. As the wire which lies in the neutral part of the field is twenty to twenty-five per cent of the whole amount of wire on the cylindrical surface, the active part is seventy-five to eighty per cent of the whole. For 110 volts the length of active wire will be $110 \div 1{\cdot}2 = 92$ feet of active wire, which must be embraced by one pole piece. On account of the winding being in two halves, in multiple arc, the length of active wire on one-half of the armature surface will be $92 \div 0{\cdot}75 = 123$, the whole length of active wire being 246 feet. The size of the wire will be determined by the allowable resistance.

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. While this was a good pressure for ordinary domestic and municipal purposes, it was a low pressure for hydraulic machinery, and entailed the use of large diameter cylinders and cumbersome plant; and, as a result of the large volume of cylinders, there was a correspondingly large consumption of water. Following the lead of Manchester, it was decided in the new works to adopt the abnormal pressure of 1,120 pounds to the square inch, or one half an English, or "long," ton. This was done on grounds of economy, with a view to reducing the heavy consumption of water at the lower pressure. Water at 1,120 pounds pressure has 22 times the efficiency of water at 50 pounds pressure; and to effect a certain unit of work there will be re-